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NOVEMBER

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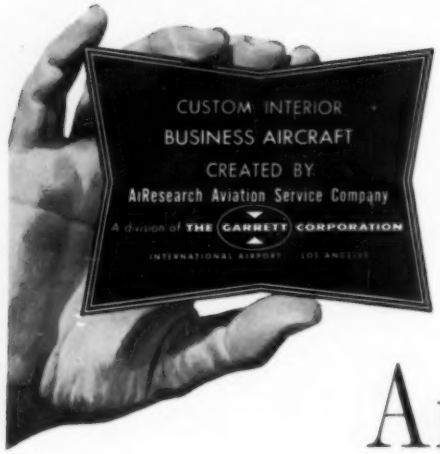

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Before *you* should unwittingly decide to fly second class in your own corporate airplane, we urge you to check into the AiResearch Aviation Service Company reputation and facility to see for yourself how the finest interiors in the world are made.

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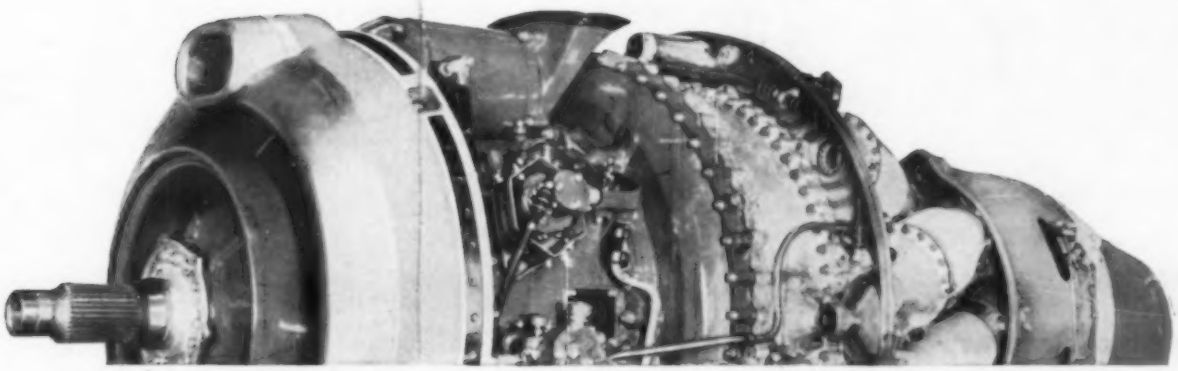

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NOVEMBER, 1960
VOLUME 67, NUMBER 5

THE COVER: Hiller's new E4 helicopter is the subject of Barney Etengoff's unusual rendering. For a comprehensive report covering the flight characteristics and engineering details of this airborne "station wagon," turn to page 32.

CONTENTS

EDITORIAL **20** *Gill Robb Wilson*
Change is always irresistible—the trick is not to foresee, but to prepare

PACIFIC AIRMOTIVE **22** *Richard L. Sweeney*
Spotlighting a modern service organization—what it is, how it operates

TEST BED FOR TOMORROW: NAFEC **24** *Myron B. Gubitz*
Automation in air traffic control and landing systems is well on the way

CHECK PILOT REPORT: BOEING 720 **26** *Ed Mack Miller*
A veteran airline pilot spotlights the capabilities of a new jet transport

PLACE IN THE SUN **29** *Oliver Stewart*
How regulations and restrictions are hampering all British private flying

THE AIRMAN'S WORLD **30** *Gill Robb Wilson*
The old order may have changed but the old-time pilots will never say die

CHECK PILOT REPORT: HILLER'S E4 'STATION WAGON' **32** *A. C. Bass*
The flight characteristics and engineering details of this new helicopter

HOW TO BRING IN THE BUSINESS **35** *Charles Spence*
Some useful tips for fixed-base operators—by a pilot-ad agency executive

EXPERIMENTAL AIRCRAFT FLY-IN **36** *Flying Staff*
Two pages of pictures of the home-built airplanes at EAA's annual show

PICTORIAL NAVIGATION FOR PILOTS **38** *Charles Britt*
ACF's new navigation instrument continuously shows aircraft's position

OPERATION BRIGHT STAR/PINE CONE III **40** *Lou Davis*
The biggest combined maneuvers since WW II field-tested our airpower

FLYING THE CARIBBEAN **42** *Allen C. Miner*
Flying down to San Juan via the Bahamas? The things you should know

AMERICA'S BUSIEST LOCAL TRAFFIC AIRPORT **44** *Cecile Hamilton*
Kentucky's Bowman Field: some 175,000 aircraft movements per year

SCAT: SPEED CONDITION/APPROACH/TAKEOFF **46** *Gerald J. Schlaeger*
A single flight instrument now coordinates the use of power and elevators

TOXIC HAZARDS IN AVIATION **48** *John T. Flynn, M.D.*
Some materials and chemicals can prove dangerous—a word to the wise

YOU CAN METALIZE YOUR AIRCRAFT **49** *Charles Gray*
This pilot put metal skin on a light plane and tells how he went about it

FLYING FEATURES

Mailbox 4
Briefings 8
New Products 11
Who and Where 11
Flying Calendar 16
Overnight Stop, No. 61 90
Hangar Flying 18
Flying Newsreel 50
I Learned About Flying From That 52
Sport Air Show 67
Picture Credits 83
The Thrust Lever 86
Advertising Index 105

IN THIS ISSUE of FLYING some new features are inaugurated, which we hope will prove of interest to all our readers. A new column (to the right) . . . another column, Thrust Lever, by a 21,000-hour veteran whose commentaries will roam the entire field of aviation . . . sections on people and products plus a new face to this page.

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WINGS and THINGS

LOOK FOR BEECH *to announce its new twin-turboprop pressurized executive transport, available in late 1962 or early 1963. Carrying six to eight passengers, the aircraft will have an "economy" cruise speed of about 300 mph, range of over 1,200 mi., and a reported gross weight between 10,000 and 12,000 lbs. Turbines will generate about 850 shp. Equipped, cost could approximate $450,000. Beech is expected to add one or two models to its line next year: a faster version of the Travel Air and possibly a third model in the Twin-Bonanza series.*

NEWLY FORMED Lane Aircraft Co., Dallas, Tex., of which Daniel Lane is president and Gerald Speare executive vice-president, is negotiating for North American sales rights to four-place Marchetti twin-boom pusher aircraft. Built in Italy, and powered by 250-hp fuel-injection engine, aircraft will be shipped to Dallas for assembling. Cost would approximate $34,000.

PIPER *about to introduce its new, side-by-side, two-place ,Pinto which will be priced in the $5,000-$6,000 class. The new airplane embraces a high wing and tricycle gear, and a 108-hp Lycoming engine. Introduction will be made at Piper's Nov. 1-2 distributor's meeting; volume production will begin Jan. 1.*

LOCKHEED AIRCRAFT CORP., long a manufacturer of airline transports and military aircraft, has entered the business aircraft market with a line of aircraft ranging from the small, bush-type LASA 60 through the new Super 26 (conversion of the military B-26 with new fuselage section), the 10-place JetStar, and its new intercontinental executive version of the turboprop Electra.

CESSNA *is expected to announce, possibly by the time this is in print, its entry into the commercial helicopter business with the four-place CH-1C. Helicopter, not yet in production, was the first rotorcraft certificated to operate under instrument flight rules.*

LOW-COST PERSONAL AIRPLANE, which will sell for $3,000 to $4,000, has been designed by C. G. Taylor for personal use. Prototype, with fibreglass cabin and wing, is being constructed in California and may fly in about three months. Small, two-place airplane will weigh over 700 lbs. and feature side-by side seating.

NEW "RAUSCH STAR," *a modified six- to 10- place (plus crew of two) Beech Model 18, reportedly will cruise at 230 kt, have an over-2,000-mi. range, and carry a 4,000-lb. payload. Designed by Rausch Engineering Ltd., South City, Calif., the aircraft is now 80 per cent structurally completed; certification is expected in 45 days. Propellers are three-bladed Hartzells; landing gear is tricycle-type; cost will be about $125,000. Fully pressurized model will carry Boeing 520A turbines and be priced at $175,000.*

BUSINESS AIRCRAFT sales are expected to increase from 8,000 units of last year to 12,000 in 1970, predicted J. N. Krebs, project engineer, General Electric's Small Aircraft Engine Division, speaking at the NBAA meeting. Krebs feels that by 1970 at least 40 per cent of all business aircraft will be powered by gas-turbine engines.

ZIFF-DAVIS PUBLISHING COMPANY, One Park Avenue, New York 16, N. Y. William B. Ziff, Chairman of the Board (1946-1953); William Ziff, President; W. Bradford Briggs, Executive Vice President; Michael Michaelson, Vice President and Circulation Director; Hershel B. Sarbin, Vice President; J. Leonard O'Donnell, Treasurer.

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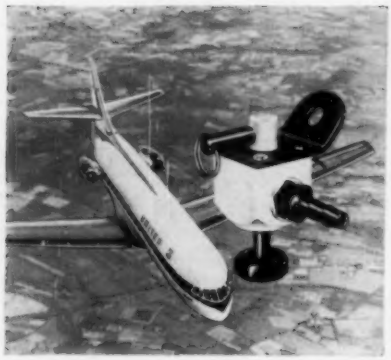
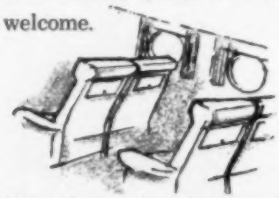


Puritan Rides the Caravelle for United Airlines

Puritan's on-and-off valve, and first aid valve for passenger outlet stations have been specified by United Airlines for the oxygen breathing systems in their fleet of new Caravelle Jets, manufactured by Sud Aviation, Toulouse, France.

The Puritan valves enable passengers to be supplied with emergency oxygen if needed, and, during normal flights, with first aid oxygen for respiratory ailments.

Your inquiry on any problem concerning high altitude breathing systems and equipment would be welcome.



Puritan's valves are mounted in the back of seats facing passengers, and in the Caravelle's bulkheads in both the lavatories, and where there are no seats forward of the passenger station.

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MAILBOX

INSURANCE PRIMER

Your article "Aircraft Insurance Primer" by Lloyd L. Grove Jr. (September issue) was very interesting and is the type which reaches and should be of interest to every pilot. However, I have noticed two rather serious omissions.

First, no mention is made of non-ownership liability. I am certain that many pilots renting or flying aircraft owned by others, have absolutely no knowledge of the liability insurance on those aircraft. Ordinarily, the insurance carried by the owner would be primary coverage.

Suppose, however, the owner carries inadequate limits of only $10,000 per person and the pilot is involved in an accident where a claim of $50,000 arises. Or, worse, suppose he carries no liability insurance. Who is going to be the fall guy in this case? Any attorney worth his salt will name the pilot as well as the owner in any action, and if Mr. Pilot doesn't have a non-ownership policy, he may as well start saving his pennies for the legal battle ahead.

Along these lines, let's not overlook the provision in the non-ownership policy for legal defense. The premium paid can be small compared to the legal costs of defending a lawsuit. It is conceivable that a pilot could be sued for negligence when he is not guilty . . . (yet) the cost of defending himself would be overwhelming.

The second omission is the licensing of companies and groups within the individual states. Of the 11 sources mentioned in the article, for example, only five are licensed to do business in New York State. Since many of these unlicensed companies solicit business on a direct mail basis, it behooves the prudent insurance purchaser to place his coverage through a properly licensed agent in a properly licensed company.

Please note that one of the companies is "pushed" by a leading pilots' association and is *not* licensed in almost 40 per cent of the states, including New York. This fact is not mentioned in any of their literature or advertising.

What does it mean . . . to do business with a licensed company? . . . let me quote . . . from the New York State Insurance Department concerning an unlicensed company: "Inasmuch as this company . . . files no reports with this department, we are not in a position to furnish any official information concerning its financial condition or policy contracts . . . there are definite advantages attendant upon insuring in an authorized company. An insured in such a company is protected by the insurance laws of this state which regulate policy forms, investments, reserve standards and other insurance operations to provide maximum protection to policy holders. An authorized company is entitled to agency representation in this state and can maintain loss adjustment bureaus for speedy and efficient handling of claims.

"In the event of a disputed claim, the services of this department are available to the policyholder. None of these advantages is obtained by a New York State resident who insures through an unlicensed company."

'Tis up to you fellows, but I'm protecting my home, car, future income, and my family's security with the proper insurance on anything I fly, be it rented, borrowed or owned. . . . Any good agent can tell you about your own state.

CARL CARLSEN

Ellenville, N. Y.

• FLYING *asked the author of this article to add his comments: Writes Mr. Grove who, incidentally, is an experienced insurance man, . . . "Unfortunately, pilots generally rely on aircraft owner's insurance to protect them, which, as Mr. Carlsen points out, is a mistake. I believe a competent plantiff's attorney will always name the pilot, as well as an aircraft owner, in a suit for damage. Therefore . . . a pilot should inquire about the insurance carried: 1.) Is he protected? 2.) Are the liability limits adequate? If he is not satisfied on either point, he should purchase non-ownership liability . . . the pilot who hires or borrows aircraft should always have this insurance (since) he is rarely in a position to know about the adequacy of the owner's insurance. . . .*

"In regard to the licensing of companies and groups in individual states, it would be impossible to qualify the list of companies in a short article . . . the idea was to list the general markets, avoiding my opinion as to what market is good, better, or best."

WRONG TWIN

I would like to correct the statement made in September "Flying Newsreel" (top of page 50). The caption states "U. S. Army twin-engine command transport, based on the H-50 Twin-Bonanza."

The L-23F is actually a Beech 65 Queen Air. . . .

ALBERT PELOQUIN JR.

North Providence, R. I.

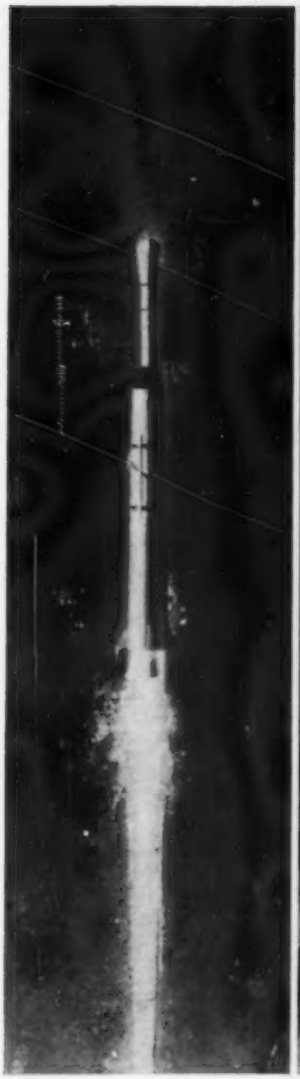
• *Right. Sometimes it's hard to tell one twin from another, but we should know better. We muffed this one.*—ED.

SHADES OF WYATT EARP

I would like to mention the assistance I received from airport manager Fred C. Taplin and his assistants at the Hayward (Calif.) airport, as I believe it points up one of the essentials of continued expansion of private aircraft.

I had just arrived in my D-35 Bonanza on which the "automatic" or governor feature of the propeller had failed south of Bakersfield. I was scared to death at the prospect of any more maintenance as I had just paid $235 for a generator overhaul and brake repair, plus cleaning the pitot

(Continued on page 6)



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"Project Echo," National Aeronautics and Space Administration's satellite launch, comes like a "windfall" research grant to scientists.

The aluminum-coated plastic sphere went into orbit folded inside the nose of a Douglas *Thor-Delta*. Researchers have been invited to further their own experiments with the aid of radio signals bounced off the satellite by NASA transmitters. Data on the orbit and signals is being widely publicized by NASA in the belief that "cooperative tests" can result in new civilian space research advances.

Such satellites may one day be used as global relay stations for radio, voice and TV signals. While this system is not a reality, the booster that can put it up already is. Douglas *Thor* has proved itself successful in 87% of its space firings. This dependable launcher is another product of the imagination, experience and skill Douglas has gained in nearly 20 years of missile development.

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Air Force Magazine said of "Rocketship X-15": "Destined undoubtedly to be considered the authoritative work on the X-15."

Flying Magazine wrote: ". . . a first . . . should be eagerly sought by professional airmen and laymen who seek an answer to what's beyond the horizons of flight today."

The New York Mirror commented: "A book for people who wonder about tomorrow."

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MAILBOX

(Continued from page 4)

lines, at Phoenix, Ariz., the day before.

At Hayward, Mr. Taplin took time to locate the trouble and then directed me to a service outfit that was both reasonable and competent. Up to that time, I was about to unload the airplane at any price as with no expense account or tax gimmicks I was in no shape for any more of the Phoenix treatment.

Maybe I just encountered an isolated case and happened to run into descendants of those who used to hold up stagecoaches in Wyatt Earp's time, and were still practicing on more modern travelers. Maybe well-healed corporations can stand the gaff, but those of us on a straight salary who, perhaps foolishly, aspire to own an airplane can't hold on long if parts and labor aren't kept within reason. I hope that the aircraft manufacturers will find time to police the activities of their distributors and dealers so that aircraft owners will feel they are on the ball.

LIEUT. COL. MELVIN C. MONROE
Ft. Rucker, Ala.

KUDOS FOR "SOARING OLYMPICS"

We wish to extend to FLYING our thanks for its excellent coverage of the International Soaring Contest (September issue). Mr. Dawydoff's long association with soaring was clearly evident in the interesting and factual summary of the contest.

Those of us in soaring are particularly proud that through the Soaring Society of America we have been able to have the U.S. represented at the world's soaring contests. Our country's participation has been made possible by contributions of individuals and corporations. It is not sponsored by the Federal government. We feel this is significant in a day when too many are too willing to depend on government to finance the U.S.'s participation in such events. The publicity your magazine has given this event is immeasurably helpful as it increases the number of aviation enthusiasts who are aware of international competitive soaring, with the result we will more likely be able to continue sending a team in subsequent years.

H. MARSHALL CLAYBOURN, President
Kansas Soaring Association
Wichita, Kan.

WADC TURNED WADD

In the September issue of FLYING in the article on the current Air Force DynaSoar project, a reference is made to Wright Air Development Center. Correctly, this should be the Wright Air Development Division; a change which took effect May 1960.

JOHN TIRPACK
Dayton, O.

TIP FOR SKIPLANE FLYING

Regarding your "Pro's Nest" article ("Make Mine Skis" by George W. LaRose) of several months ago . . . I would like to add a trick I use when snow is wet and deep. By taxiing up and down the take-off path a few times, I get a track with hard snow to take off on. I then start at far end of the track with flaps up. If the aircraft still isn't airborne at end of the track, I lower flaps to full-lift position—and as fast as possible. The sudden increase in lift then usually tears the aircraft from the ground, and I'm airborne.

Beware that it takes careful handling not to stall, since you take off around and even below stalling speed. When experimenting, be sure to use large field.

KAJ BJERKE, Cadet
Swedish Royal Air Force
Djursholm, Sweden.

"AG" FLYING

Congratulations on Jack Wright's article (August issue) about "ag" flying. I feel I have learned quite a bit about this business from his description and clear writing.

We in the San Joaquin (Calif.) Valley constantly see these people working overhead and, as a novice, I admire their courage in doing such a necessary job.

JOHN H. ADAMS
Kingsbury, Calif.

I have just read "So You Want To Be A Crop Duster" in the August issue of FLYING. All I can say is hooray for the writer!

My husband is the ardent reader of FLYING in our family (I usually tend to my knitting) but when he showed me the article, and I read it, I thought this really strikes home.

My husband is an ag-pilot and for the past seven of his 20 years of flying has been engaged in this type of flying. This is a big business and it takes highly skilled pilots to fly ag-planes. It is hard, exacting work, and there is no room for daredevils. There may be some, but I'm afraid they are not around very long.

Usually, the first thing a person says to me when they learn of my husband's profession, "Don't you worry . . . isn't it risky?" Sure there is a risk, but there is a risk also with a lot of jobs. How many traveling salesmen are killed on the highways each year? . . . My husband's company has been in business a good many years. The maintenance is excellent, and the company has a good safety record. Their aim is "to satisfy the farmer"; and I'm sure you'll find a lot of companies like that.

Believe me, my husband takes great pride in his profession. . . . It's an important business—and let's face it, it's here to stay!

MRS. THOMAS MOUSER
Visalia, Calif.

INFORMATION WANTED

I am compiling information on WW II aircraft which are surviving throughout the world, whether in airworthy condition, in a museum, or stored. I'm trying to make this a detailed survey and would welcome information from readers here and abroad.

ROBERT W. GORGA
2308 S. Ridgeway
Chicago 23, Ill.

REVITALIZED NAA

Reference your editorial "As In The Beginning" in the September issue on revitalization of the National Aeronautics Association, splendid! I was once treasurer of local chapter 192.

CHARLES F. WILLARD
FAI Pilot No. 10
Los Angeles 27, Calif.

Précision

A French word that means the same thing in English: quality or state of being precise; accuracy; definiteness. It's a precise description of an Air France pilot. Exacting. Accurate. Definite. An alert mind guiding skilled hands to precise action. Everyone expects it. Everyone who's ever flown Air France finds it. They find something else, too. The same quality of precision in everything. Food that is prepared in the great French tradition. Service that is accurate, and attentive to every detail. Atmosphere that is friendly, enjoyable, and authentically French. Precisely what you want...precisely what you get...*every time!*

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BRIEFINGS...

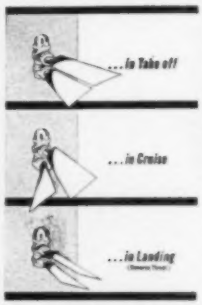
JET-POWERED AIR FREIGHTERS capable of handling 100,000 pounds of cargo at 600 mph were forecast recently by the Boeing Airplane Company. The 735 freighter version of the Intercontinental 707 airliner could be ready for service in 18 months but only upon on firm orders from airline operators. The 735 would be in two versions, a standard airframe and a swing-tail, and will cost $6,125,000 each; and have a range of 3,000 miles nonstop, operating at three cents per ton-mile.

FIRST TWO PRODUCTION *models of the Super-V twin-engine conversion of the Bonanza manufactured by Bay Aviation Services Co., Oakland, are FAA certified, with six more on the production line. Named distributors for the Super-V are: (l to r) B. G. Vandre, Van's Air Service, Madison, Wis.; George Clark, Fleet Mfg. Ltd., Toronto, Canada; Wil Paris, Central American Airways, Louisville, Ky. and John Randolph of Southland Aviation, Inc., Hope, Ark. Modification kits for conversion, as well as the completed model, are available from these distributors.*

FAA HAS AMENDED its recently established requirement that all airmen applicants for medical certificates automatically sign authorization to release of additional medical history. New amendment now requires release of such information only upon specific request. Additionally, FAA is delegating authority to its 3,500 aviation medical examiners to both issue and deny issuance of medical certificates to applicants they examine. It also is creating a Medical Advisory Panel for impartial review of petition from airmen for exemption from medical standards of the agency. Specifically, the panel will consider each petition first, and then only upon its recommendation will the FAA Administrator take action.

THE U.S. NAVY *claims a new world class record for its McDonnell F4H Phantom II. Piloted by Marine Lieut. Col. Thomas H. Miller, the F4H, powered by two General Electric J79 engines, flew over a 500-kilometer triangular course above the Mojave Desert on September 8, at 1216.78 mph., 400 mph faster than marked up by a McDonnell RF-101 Voodoo for the Air Force in April 1959. The record is unofficial until recognized by the FAI.*

HAMILTON STANDARD has under development a variable-camber propeller which, by changing camber, or surface curvature, of its blades, makes it possible to adjust the lift of a propeller blade to the most efficient level for any flight condition. This propeller, for which the company has a Navy development contract, would use six or eight blades mounted in sets of two on a common hub, with the rear blades staggered behind the front ones. To change camber, the propeller automatically alters the angles at which front and rear blades meet the air, thus creating the effect of a single airfoil surface similar to an airplane's wings with flaps extended. Prototype will be flying in six months.



FAA HAS AWARDED *a $22,200 contract to Sylvania Electric Products, Inc., Salem, Mass., toward development of an inexpensive approach light system for small airports. The projected system would be a landing aid for light aircraft that normally operate from such airports.*

INLAND AIRPORT. Halifax International, the newest in Canada's chain of modern air transport facilities, was officially dedicated September 10, last. Built at a cost of $18 million, the airport covers an area of 2,447 acres; has two paved runways—the longest 8,800 feet which can be expanded to 10,000 feet—and is equipped with the latest in navigation aids. The $4,500,000 terminal building (see photo) is equipped to handle health, immigration and customs necessary to a Canadian port of entry.

GEARING ITS ACTIVITIES to keep step with increasing commercial aircraft markets, Beech Aircraft has created a new Marketing Division. Top personnel in the new division: (l to r) Michael G. Neu-

berger, v.p., export sales; Leddy L. Greever, v.p., domestic sales; Wyman L. Henry, v.p., marketing; Phil McKnight, public relations and advertising; John F. Allen, products development; Paul E. Allen, manager, parts and service operations.

ON CHICAGO'S *near North Side at 204 E. Superior St., a key club, catering exclusively to pilots and their guests, was opened recently. To make the pilot feel at home the bar stools are equipped with safety belts. Aviation decor is carried throughout three dining rooms and a lounging room provides current weather information and a flight planning area. The club's outside sign is the tail of an airplane.*

HEADQUARTERS ARDC, Andrews AFB, Md., reports development of a successful method to eliminate the tell-tale vapor trails (contrails) of high-flying jet aircraft, caused by the condensation of hot jet gases. The new method consists of mixing tiny dust-like particles in the engine exhaust, thus reducing the size of the water vapor particles with the result that the vapor trail is made up of droplets too small to be visible from the ground. Final testing was carried out in a B-47 jet bomber.

CESSNA AIRCRAFT'S *next entry into the business aircraft market is revealed by the company to be a four-place, light-light twin-engine plane "of high performance and with all the simplicity of a single-engine airplane." According to vice-president Del Roskam, aviation division, a prototype of the new model will be test flown early in 1961 with production models ready the following year.*

JOINT WINNERS of this year's Collier Trophy Award are: Convair Division of General Dynamics, the U. S. Air Force and Space Technology Laboratories Inc., so honored for development of the Atlas missile. This marks the first time the Collier Trophy, established in 1911 and presented annually by the National Aeronautics Assn., has been given in the field of astronautics.

UNDER SPONSORSHIP *of the National Assn. of State Aviation Officials, a manual entitled "Community Planning for Air Transportation" has been prepared as a guide for persons interested in obtaining, retaining, and developing commercial air transportation in their respective communities, and to facilitate presentations in CAB*

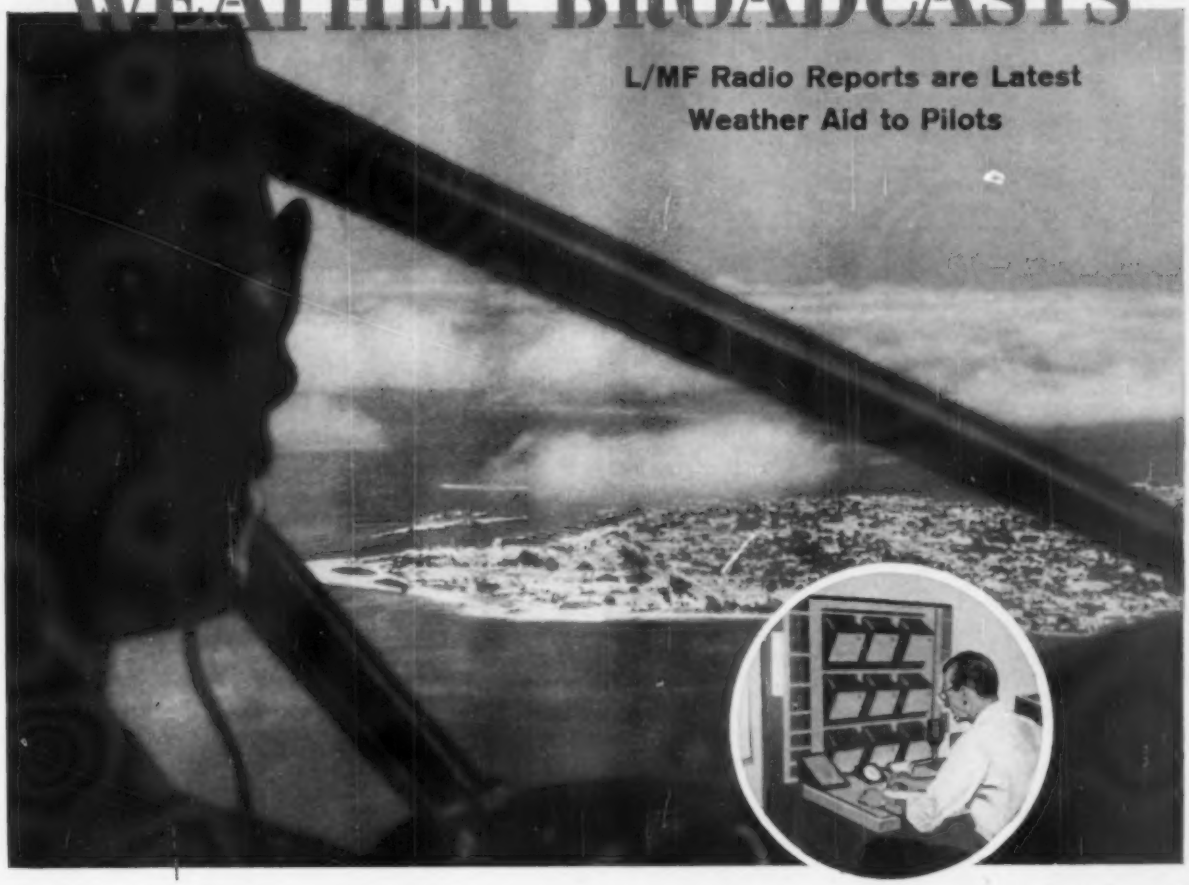
(Continued on page 106)

Mobil

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau

TRANSCRIBED
WEATHER BROADCASTS



THE U.S. Weather Bureau and FAA's latest innovation—a low and medium frequency aircraft weather reporting service—is a real boon to VFR planning and flight safety!

Now pilots can tune in on the 200 to 400 KC frequency (L/MF range or H facility) and receive the latest meteorological and Notice to Airmen data. Even owners of the small, relatively inexpensive 3 to 4 wave-band radios covering these Frequencies can pick up this important information. These taped reports and forecasts are presently broadcast continuously by FAA-ATCS stations in 12 cities across the country. After identifying itself, the station gives the weather conditions for a radius of 250 miles, pilot reports (PIREPS), wind aloft data and radar reports, when available—plus reports on actual weather at selected locations within a 400-mile radius. The pilot is kept informed of the fronts and pressure systems for the following 6 to 12 hours, small aircraft warnings in effect in the next 2 hours, and forecasts of significant area and route weather for the subsequent 8 to 12 hours.

Experienced pilots use all of the up-to-date methods that assure safe, sure flights. That's why so many choose quality Mobil products . . . fuels and lubricants that are a result of progressive research and the most modern technology . . . products of unsurpassed performance and dependability! As always . . . *You're Miles Ahead with Mobil!*

FAA-ATCS Stations and their broadcasting frequencies

Chicago (Joliet), Ill.....350 & 257 KC	*Cleveland, Ohio.....344 KC
Indianapolis, Ind.....266 KC	Denver, Col.....379 KC
Los Angeles, Calif.....332 KC	Fort Worth, Texas.....365 KC
New York, N. Y.....209 KC	Pittsburgh, Pa.....254 KC
Washington, D. C.....332 KC	Boise, Idaho.....359 KC
Boston, Mass.....382 KC	Cincinnati, Ohio.....335 KC

*Test Basis

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MOBILGAS AIRCRAFT

MOBILOIL AERO

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500

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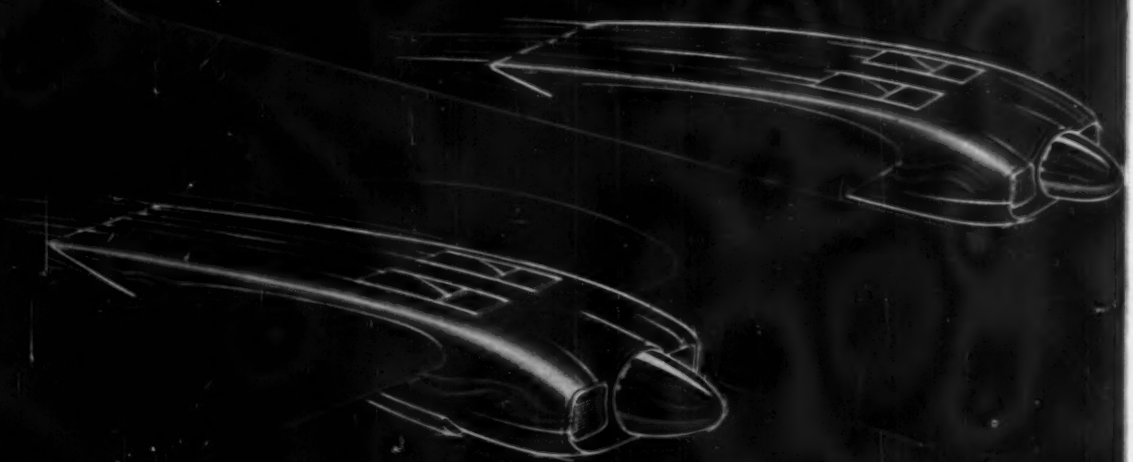
AERO COMMANDER

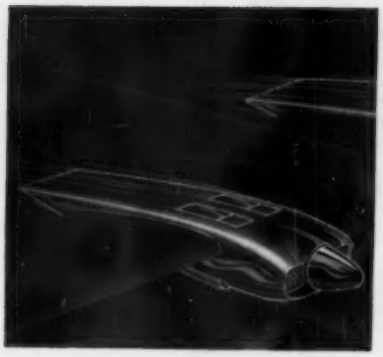
featuring the compact, new

SPEED-LINE NACELLE



AERO COMMANDER

AERO DESIGN & ENGINEERING CO • BETHANY, OKLAHOMA • another product of ROCKWELL-STANDARD CORPORATION



AERO COMMANDER
500B

NEW SPEED
NEW POWER

The all-new *500B* mounts two *LYCOMING* IO-540-B1A engines that develop *290 HP* each with 80-inch, *FULL FEATHERING, THREE-BLADED* Hartzell propellers! With a top speed of *233 mph*, this spirited, new *AERO COMMANDER* will cruise at a steady 222 mph.

SPEED LINE DESIGN

The brilliantly efficient compactness and streamlining of the new nacelle so minimizes the frontal area that drag is substantially reduced, vastly improving fleetness and performance. *GEAR IS FULLY RECESSED.* Above-the-wing exhaust carries engine noise away; inside, it's *WHISPER-QUIET!* Luxurious, new leather-trimmed interiors, in your choice of elegant colors.

CALL WHitney 9-5674 FOR DETAILS ON THE ALL-NEW AERO COMMANDER 500B!

NEW PRODUCTS

EARLY 1961, Collins Radio will be ready with its new WP-103 Airborne Weather Radar System, weighing 49.9 pounds—one-sixth as big and one-eighth as heavy as the Collins WP-101 system. A pulse-modulated radar system operating in the X-band frequency range, the WP-103 requires 320 watts AC; scans the general sky area up to 150 nautical miles. Transistorized, the system includes five basic units: receiver/transmitter, synchronizer, control kit, indicator and 12-inch dish antenna. Also, 18-inch and 30-inch antennae are available.

TWO-WAY VHF RADIO, *designated the VHF Superphone, is being produced by Skycrafters, 1365 Gladys Ave., Long Beach, Calif. The new unit has 24-channel transmitter and tunable receiver which covers 108-128 mc; complete interphone system with separate level control; whistle-stop tuning; simultaneous loudspeaker and headphone; and I.F. type noise limiter. It weighs five pounds. Available through Air Associates, Inc., the basic two-crystal unit sells for $299 complete.*

DESIGNED SPECIFICALLY for aircraft protection, the Aero-Space Division of Walter Kidde & Co., Belleville, N. J., is marketing a two-pound-charge fire extinguisher to be used on Class B and C. fires. Made of steel with trigger-operated aluminum valve, this extinguisher conforms to ICC-3HT-2000 specifications, and is approved by Underwriters' Laboratories, Inc.

LATEST IN NARCO'S *line is a low-cost ILS glide-slope receiver, designated the UGR-1. Weighing 6.75 pounds complete with shock mount, it has 20-channel capability, measures 5 by 5 by 10" and is FAA TSO'd (C-34, Category B). Designed for business aircraft, the receiver (shown here) features the new Narco-developed motor-driven electro-mechanical switching system. Use of hybrid tubes eliminates need for heavy separate power supply. UGR-1 drives panel-mounted Narco CS-5 or ID-5 cross-pointer indicators or any combination of ARNIC standard indicator loads, and sells for $695.*

A DIGITAL computer demonstrator, which will aid instructors in explaining the basic principles, as well as the operation of the electronic units of more complex computers, is offered by Aironics, Inc. of 1035 E. 26th St., Hialeah, Fla. The new unit solves many first-degree equations and handles problems of addition, subtraction, division and multiplication.

PROPELLER DE-ICING SYSTEM *for light twin-engine aircraft, a scaled-down version of electrical systems used on much larger aircraft, is a new development of the B. F. Goodrich Aviation Products Division, Akron, O. Weighing eight to 10 pounds complete, the BFG de-icer requires nine to 11 amps of power to operate both propeller assemblies. The new system, recently adopted by the Navy for its Piper Aztecs, is FAA-approved as "non-hazard installation" on the Beech Travel Air, Piper Apache and Aztec. It will be supplied in kit form for Aero Commander, Cessna 310, Beechcraft D & E-18, Twin-Bonanza and Model 95. Suggested list price is $995, including installation kit.*

NEW TRANSISTORIZED ADFs, designed specifically for general aviation, announced by Narco and Motorola. Narco's ADF-29 unit weighs eight pounds, has only one moving part (the indicator needle), a fixed antenna (Narcomatic Sensor) which, when installed on the airplane skin in a shallow streamlined housing, protrudes two-and-a-quarter inches. Price for complete unit is $895. Motorola's ADF-T-12 weighs nine-and-a-half pounds, employs printed circuitry. Indicator has a standard three-inch dial for easy readability. The light fixed-loop antenna has built-in quadrantal error compensation. Receiver will operate on either 14- or 28-volts.

WHO and WHERE

J. R. MUEHLBERG *now heads aviation sales for Esso Standard Division, and Humble Oil & Refining Company, both affiliates of Standard Oil of N. J. He succeeds Robb C. Oertel who joined Esso in 1929 and retired last September 1.*

RALPH V. WHITENER is new director general of the National Aeronautics Assn. Mr. Whitener comes from the Air Force Assn., where for 11 years he served as program director.

AT DOUGLAS AIRCRAFT, *Schuyler Kleinhans, 27 years with the company, to director of advanced research; and Charles R. Strang, 24-year veteran, to chief engineer, transport aircraft engineering.*

KING RADIO CORP., Merriam, Kan., has appointed William E. Kelley to position of general sales manager.

LEWIS N. BAYNE *to manager of FAA's Aeronautical Center at Will Rogers Field, Oklahoma City.*

ROBERT J. GEIS, former domestic sales manager for Aero Design and Engineering Co., has become director of executive aircraft sales for Air Carrier Service Corp., a subsidiary of California Eastern Aviation, Inc. in Washington, D. C.

TO MOULTON B. TAYLOR, *Longview, Wash., The Franklin Institute has awarded its Edward Longstreth Medal for his development and marketing of his flying automobile, the AEROCAR, a roadable airplane which holds two persons and 100 pounds of baggage. It cruises at 100 mph.*

Since business flying
came of age
no plane has
captured the
air world's
imagination like

THE BIG NEW LA-4 LAKE AMPHIBIAN

ANCHORS AWEIGH! New V-bow and lighter wing loading get you airborne in only 1125 feet . . . with four big people!

AMPHIBIOUS MEANS IT! No landing strip? Power the long, sleek hull up on the beach . . . then taxi back in the water!

YOU'RE GOING PLACES! Lake's long range takes you where you want to go and brings you back — *fast!*

New versatility, new performance combine to make Lake the world's most useful (and exciting) plane

Look in your dictionary. What does it mean? "Amphibious" means being equally at home in water or on land.

Think then: What does this mean *to you?* In the new Lake LA-4 you have a new standard of flexible, dependable air transport. Lake picks you up and sets you down in more places you want to get to . . . on land or water . . . than you ever thought a plane could go.

Coast-to-coast and overseas, this big, lively, 4-place amphibian is firing the enthusiasm of pilots who thought they had seen everything. It is gunning the imagination of men in business and the professions who find in it a new way to pinpoint destination and make the air more than ever their partner in conquering time and distance.

Faster climb, higher speed, bigger load, longer glide, gentle let-down are part-and-parcel of the new Lake. With them go multi-engined "feel" in the roughest air . . . unprecedented stability in water handling.

No wonder the word goes out: "When you want to fly, go jump in a Lake!" For here is the fresh, exciting, *practical* product of air-minded American imagination . . . perfectly designed to help men like you who do the world's work, do more of it, to your greater profit. Write for complete Lake description. Or phone or wire for the name of your nearest Lake Dealer, *today!*

Lake AIRCRAFT CORP.

No other plane . . .
looks . . . flies . . .
like the Lake

MANUFACTURERS of the Lake LA-4
Sanford, Maine • Telephone: 2390
John F. Strayer, President

Want to expand in aircraft? Dealer franchises are open in selected areas, both in the United States and abroad.

ON FREQUENCY EVERY TIME...

Collins crystal-controlled tuning

Dial your frequency — don't search for it. Collins crystal-controlled tuning puts you on frequency, and you stay on. No drifting with any Collins receiver or transmitter. Check the 360 channel, panel mounted 618F-1 Transceiver with your distributor or write Collins for literature.

COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA • DALLAS, TEXAS • BURBANK, CALIFORNIA

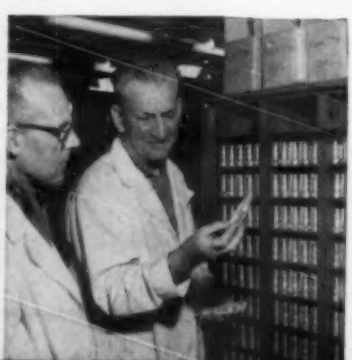
ONTARIO'S FLYING FIREMEN

Champion-fired Beaver bombs forest fire with 100 gallons of water from rotating steel drums atop pontoons—a unique fire-bombing system recently perfected by Ontario's Air Service. (Skimming lake for takeoff, drums fill with 1,000 pounds' water in 15 seconds via immersed snorkel.)

(Advertisement)

George E. Ponsford, Supervisor, Air Service Section, Ontario Department of Lands and Forests.

H. J. Phillips, Plant Supt., and W. B. Buckworth, Asst. Supervisor, (l/r) inspect shop at Air Service headquarters. Engineer Percy E. Parr, left photo, cleans Champion spark plugs for further service in bush planes. At right, Stock Clerk Bernie Gay and Stockkeeper Ralph Stone (l/r) check inventory of Champion's new REM40E *Foul-Resistant* spark plugs.



A behind-scenes report on the 45-plane Air Service section of the Ontario Department of Lands and Forests

by HERB FISHER

international aviation authority, veteran test pilot, author

In the far reaches of 412,000-square-mile Ontario Province, thunderheads poise for a fiery foray. A lone patrol plane takes note. Soon lightning is hop-scotching across hundreds of miles of rich forestland. Small fires spring up. Their *potential*—as demonstrated horribly in years past—is that of incalculable destruction to natural resources, human life . . .

On the heels of the lightning, however, comes the lone patrol plane. And before long, fledgling fires are quashed by tons of water dropped from the skies.

But one fire has escaped detection. It's a "sleeper"—just smoldering now. Days pass. Then winds pick up. And flames sweep furiously across the land.

Only a massive, co-ordinated effort can check this surging inferno. De-Havilland Otter and Beaver aircraft converge from distant points. Ground crews inch forward via canoe. The "flying firemen" water-bomb racing spearheads, trying to slow the fire's advance until ground forces can concentrate more men and equipment. Planes drop tons of supplies, including pumps to bring lake water into play on the fire. In this remote area, an effective ground assault would be impossible without highly efficient air support. In a few days, the fire is under control . . . and a holocaust, like the one of 1916 which took 224 lives, is averted.

Fire detection and suppression is an important duty of the Air Service section of the Ontario Department of Lands and Forests, headquartered at Sault Ste. Marie. Forty-five aircraft—37 Beavers, 7 Otters and a Widgeon, all float- or ski-equipped—operate from 28 bases scattered throughout the vast province. In 1955—a bad fire year—the planes logged 17,785 hours on fire duty!

But Ontario's "flying firemen" have many other duties, too. Flying in all kinds of weather, they wing swiftly across forest, lake, muskeg and subarctic tundra—a comforting influence in the lives of thousands of Canadians . . .

They assist in wildlife conservation—dropping fish in remote lakes; transporting beaver and other fur-bearers to places where such populations have dwindled; shadowing the trails of fish- and game-law violators; helping on trap-line inspections and wildlife censuses—moose to muskrat. They assist foresters in timber management and aerial survey, inspecting remote logging operations, transporting government timber scalers, carrying survey parties with food and equipment to and from wilderness bases. They do governmental research—like experimental salmon transplanting.

These winged watchdogs also assist provincial police in law enforcement and rescue work—man-hunts, lost children or tourists, drownings. They provide rapid transportation for investigation of bush accidents and crimes. They make countless mercy flights and rescue missions—everything from getting little polio victims to hospitals in time, to evacuation and supply work at flood sites.

The sturdy workhorse planes they fly were designed and developed by De-Havilland expressly *for* the Department's bush-flying requirements—to carry the greatest possible load with speed, range, and *short* takeoff/landing capability. Thus they can negotiate most of Ontario's quarter-million lakes! And despite extremely hazardous operating conditions at times, the accident rate of the 45-plane fleet remains amazingly low.

"That's because we put everything we've got into pilot training, aircraft maintenance, and aircraft parts and equipment," W. B. Buckworth, assistant Air Service supervisor, said. "Back in the bush, a pilot makes maybe 30 takeoffs and landings a day—and you combine *this* procedure with the all-weather flying we do, and let me tell you! *Those engines really take a beating!*

"There's not a bit of maintenance that goes into those engines that isn't the best we can do—and there's not a bit of equipment that goes into those engines that isn't the very best we can buy. And in our operation, we well *know* what's *best!*"

A spark plug's *dependable* performance is *critically important* to safe engine operation, for example—and pilots of the Air Service rely on *Champions exclusively*. Plugs are cleaned at 200 hours, then re-installed for another 300 hours. At the moment, the Air Service is equipping its Pratt & Whitney engines in Beaver and Otter aircraft with a new kind of Champion plug—the widely acclaimed REM40E *Foul-Resistant* plug. These plugs are self-cleaning: a two-prong electrode, longer core nose, and bigger bore allow combustion gases to keep firing tips blasted clean of fouling deposits. The foul-resistant Champions are ideal for hop-skip-and-jump operations like that of the Air Service—as well as for prolonged-flight operations.

"When you're flirting with blazing tree tops and tricky updrafts—or trying to wiggle in and out of tiny lakes with maximum loads—it's *especially* comforting to know your engine's going to deliver *instant* full-power when you put the throttle to it," Mr. Buckworth said.

Ontario's Air Service does, indeed, know how to get the *best* in performance from both man and machine . . . this watchdog outfit has been guarding the Northland for 36 years now, and its record is mute but monumental testimony to a job well done.

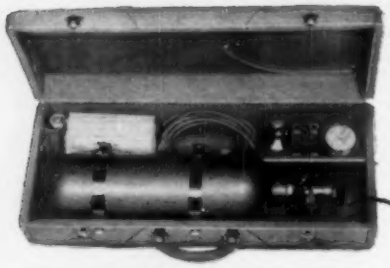
CHAMPION SPARK PLUG COMPANY
TOLEDO 1, OHIO

At Sault Ste. Marie—headquarters for maintenance, pilot training, administration—a Beaver is fitted with rotary water drums, latest in fire-bombing devices. With million-dollar hangar addition built in 1947 (capacity, 50 planes), headquarters base is self-sufficient—does *all* airframe, engine, and instrument overhaul, even manufactures own laminated-birch skis.

O. V. Robinson, Senior Air Engineer, finishes Pratt & Whitney engine overhaul with installation of Champion's new REM40E *Foul-Resistant* spark plugs.

IF YOU WANT THE BEST!

Choose with confidence, either of these famous SCOTT OXYGEN PORTABLES



THE Scott AVIOX

in Beautiful Luggage Case

$324.50 COMPLETE

1. Complete Oxygen Breathing Equipment for Four.
2. Adjustable Altitude Control increases duration.
3. Can be used with spare oxygen cylinder for replacement in flight.
4. Everything — cylinder, regulator, masks and hose in a handsomely appointed leather case.
5. Charging Coupling and Disposable Masks included.
6. Provides the ultimate in efficiency and quality for those who want the very best.

CHOOSE THIS OR THIS

$115.25 LESS MASKS

THE Scott EXECUTIVE

1. Lowest Price consistent with Quality.
2. Most compact and light-weight.
3. Serves two persons to 20,000 feet.
4. Duration time 5 hours — 1 person. (2½ hrs. each for two.)

When you choose an oxygen system, do it carefully. Your life may depend upon it. Check quality, service and reputation of the manufacturer. Scott builds the most complete line of business, executive, airline and military oxygen equipment. Scott sales, service and recharging facilities are the world's most widely known and respected. The quality and workmanship of Scott Breathing Equipment cannot be surpassed. Write for complete information.

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West Coast Office: Fulton-Ventura Bldg., 13273 Ventura Blvd., Studio City, Calif.

FLYING CALENDAR

November 2-18—Island Hopping in the Caribbean, "package deal." Nassau, Trujillo, St. Thomas, Barbados, Trinidad, Fort de France, Antigua, San Juan, Port-au-Prince and West End. Enter at Ft. Lauderdale. Sponsored by Florida Aero Club. Contact: Harry B. Collins, Air Cruise Director, 375 N.E. 154th St., North Miami Beach 62, Fla.

November 3-5—Third Annual Michigan Industry, Missile and Space Conference, Cobo Hall, Detroit. Sponsored by Michigan Aeronautics and Space Assn.

November 14-16—National Aeronautic Assn. Annual Convention, Indio, Calif. Contact: NAA, 1025 Connecticut Ave., N.W., Washington 6, D. C.

November 14-18—Thirteenth Annual Air Safety Seminar, in co-operation with Flight Safety Foundation [468 Park Avenue South, New York 16, N. Y.], Phoenix, Ariz.

November 15-17—Aviation Distributors and Manufacturers Assn., 36th meeting, Riviera Hotel, Palm Springs, Calif. Contact: ADMA, at 1900 Arch St., Philadelphia, Pa.

November 16—Second Annual Dinner and Aviation Variety Show, at the Four Chefs Hall, Hellerman and Sackett Sts. [6500 Frankford Ave.], Philadelphia, Pa. Sponsored by the Delaware Valley Soaring and Power Pilots Assn., with co-operation of local A.O.P.A. units, Soaring Society of America local clubs, C.P.A., etc. For reservations: Jack Devins, Chairman, Box 43, Abington, Pa.; or evenings, call TU 7-4799; days, call CU 9-4114.

November 25-27—Snowbird Soaring Meet, Harris Hill, Elmira, N. Y. Visitors welcomed, demonstration soaring flights available. Contact: Cid Carvalho, 285 Mapleview Drive, Tonawanda, N. Y.

November 30, December 1-2—Futuronics Exposition, Roosevelt Raceway Exhibit Hall, Westbury, N. Y. Sponsored by Long Island Manufacturers Council, includes exhibits by Sperry, Grumman, Fairchild Camera and Instrument. Theme of the technical meetings will be Forecasts in Electronics, with different sessions covering Systems Concepts, Component Developments, and U.S. Government Needs. Roosevelt Raceway is 45 minutes from New York by parkways.

December 6-8—Twenty-first Annual Convention, National Aviation Trades Assn., Oklahoma City, Okla.

December 28-30—Seventh King Orange International Model Plane Meet, Miami, Fla., includes the World Airline Scale Model Championships, open to personnel of any, and all, airlines. Sponsored by Air Training Corps Flying Club. Contact: Tom Sutor, 5313 Granada Blvd., Coral Gables 46, Fla. Over $5,000 in scholarships, trophies, etc., to first to third-place winners in 30 modeling events.

Calendar items must be received by FLYING's editorial office, 1 Park Avenue, New York 16, N. Y., two months prior to the event.

Movie stunt flying... right down on the deck

Putting a 30-year-old biplane through its paces for the movie cameras is a tough assignment... calls for split-second timing and perfect engine response. It's bread-and-butter work for Joe Pfeifer of Porterville, California. He and his fleet of 1930 vintage airplanes have appeared in many motion pictures.

"When you're pouring the coal to an old-time veteran like this one, you've got to be sure of your engine," reports Joe. "We *make* sure with RPM Aviation Oil Compounded.

"RPM" keeps our aircraft in top flying condition and holds wear to a minimum. Rings and valves stay clean as new. I've never had any engine trouble using "RPM"... and in my kind of flying, that's saying a lot."

Joe Pfeifer's fleet of early-day planes is the largest still operating. It includes a modified Pfeifer Fleet biplane, Phillips Skylark, Davis DWL and a Fairchild 22.

CHEVRON AVIATION FUELS

AVIATION OILS RPM

We take better care of your plane

T.M.'s "RPM," "Chevron," "Plane Fax," Reg. U.S. Pat. Off.

STANDARD OIL COMPANY OF CALIFORNIA

HANGAR FLYING

BEWARE OF VERTIGO

WHILE on a training mission the night before, poor weather and an extended approach time had forced us to divert from our home base in San Diego to N.A.A.S., El Centro, Calif. We were flying a Douglas F3D 124659. As San Diego weather continued to deteriorate I decided to try again in the morning.

Dawn found it overcast and raining in El Centro, but the front had passed San Diego, which was reporting low scattered and 5,000 broken with good visibility. I decided that this would be a good chance for some instrument time with a no-sweat approach at home, still getting the plane back in time for morning operations.

Aerology was encouraging with estimated cloud tops en route of 16,000, so I filed for 20,000 feet, requested a low-frequency ADF penetration with GCA pick-up and we hustled out to our bird.

About 10 minutes out, over southern California's Laguna Mountains we ran into some "bouncy" type turbulence, the LF navigation radio was emitting loud "cackles," with the ADF needle pointing dutifully at each "cackle," and the UHF voice radio seemed a thing of the past. I got down to the business of flying heading and altitude and we dead-reckoned along. Approaching San Diego, by the clock, I really wanted to talk to somebody and tried switching from en-route frequency to Air Force radar to approach control with no luck.

Getting my attention back on the instruments, everything seemed all right—nearly. I remember thinking that I had been taught the attitude gyro wasn't supposed to look that way. Old 4659 quickly solved my problem by reacting the same way any other plane will when rolled onto its back.

My solution to this sure-fire unusual attitude was strictly by the book. Throttles back to idle, speed boards out, roll right-side up and pull. The only thing was that my buddy, the radar operator, said that the artificial horizon in his scope "went around twice, maybe." The airspeed stopped building up but the altimeter kept right on unwinding. Passing 10,000 I lost all interest in this unusual attitude business and ordered a bail-out, popping the emergency hatch. (The F3D does not have ejection seats, but an escape chute.) Before my R.O. could get out of his seat we dropped out of the bottom of the clouds around 7,000 feet (luckily past the mountains). Hauling back mightily and considerably exceeding its "g" limits, I leveled the aircraft.

After that, a long moment of silence, and I banked toward home and, of course, approach control now came in loud and clear. I cancelled my IFR and started to ease the throttles, when one engine flamed out. After a normal air start we reached our base, informed them of the possibly "shaky" condition of 4659, and inquired about any difficulty in landing an F3D with the bottom door hanging down. They knew of no particular problem so, after burning off a little excess fuel, Navy jet 4659 made one of the nicest landings in her career.

Attempting to find a cause, the flight surgeons gave us a good going over and, not finding anything wrong with us, could only offer an explanation of disorientation or vertigo resulting from the combination of turbulence and my head movements while changing radio frequencies.

JAIME P. ALEXANDER

Boulder, Colo.

AN ICY FLIGHT

IT WAS April 12, 1957, in the Fort Worth, Meacham Field, Tex. weather station. I was one of many pilots studying the weather maps and conflicting reports from a clattering teletype machine. I was plotting a route back to Topeka, Kan. to miss freezing rain and low-hanging clouds in a stationary front over Oklahoma.

I was flying the Mayor of Topeka, George G. Schnellbacher, home to attend an important conference. His mother had joined us at Fort Worth and was looking forward to this flight with her son.

I filed a VFR flight plan for Oklahoma City and helped the mayor's mother into the rear seat.

We had been warned to fly close to the deck because of icing conditions, so we set course at 800 feet. Ten minutes later I was alarmed to find I couldn't see through the windshield. The outside temperature was dropping and beads of ice started crawling across the windshield with rime ice forming at the sides, so we dropped to 600 feet. Twenty-five miles south of Ardmore, Okla., we decided to make use of its airport as ice stalagmites were sticking out like pitot tubes on leading surfaces, and descended to 400 feet in search of warmer altitude. Now the outside temperature was 32 degrees F. At this altitude we suddenly plowed through a hail storm. We were approaching a ridge so it became necessary to put the vertical stabilizer into the base of the clouds to give us minimum clearance.

For a period of two minutes we flew almost blind. It was then that ice piled on so thickly on the Tri-Pacer that I couldn't figure why it stayed in the air. Even with full throttle the ship was losing altitude at a rate of 100 feet per minute. Dimly, I could see the edge of the woods so with a prayer I pointed the nose towards the clearing. At 130 mph, my copilot applied quarter flaps which stopped our descent momentarily. We cleared the edge of the woods by six feet and a wire fence by six inches. The plane stalled at 90 mph with half flaps. Gently, I lowered the nose wheel to start breaking our roll on the waterlogged pasture. With mud covering the hubs, we sloshed to a stop. I chopped the master switch and we just sat. Minutes later a small voice from the back seat exclaimed, "Nice flight, boys."

RICHARD C. ROBBINS

Topeka, Kan.

(Advertisement)

JOHN K. NORTHROP, Cofounder
Chairman, Board of Trustees
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Manned flight of over 2000 miles an hour ...more than three times the speed of sound; astronauts in training to be placed in orbit around the earth; atomic powered, missile launching submarines; supersonic airliners on the drawing boards...what exciting and awe-inspiring times we live in!

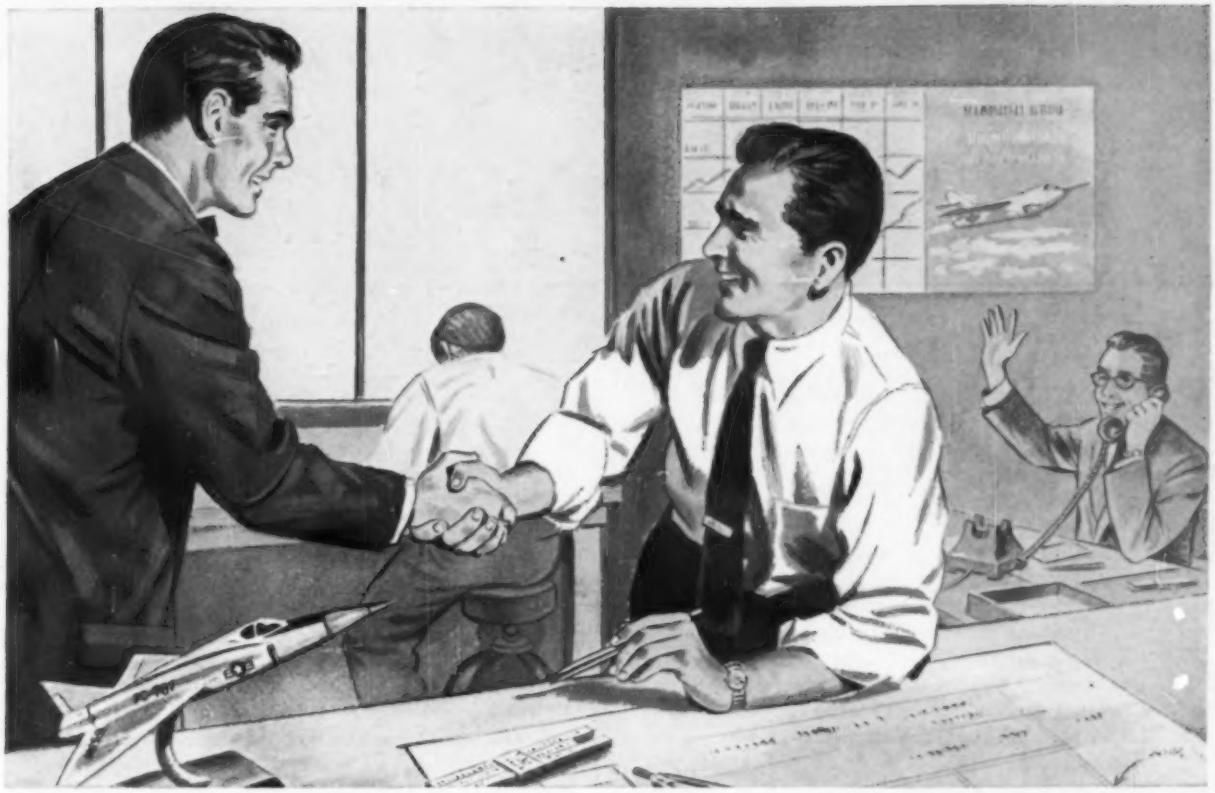
I have often said in the past that there was a great future for alert, ambitious young men in the many fields of modern technology. Now, as I view the careers of Northrop Institute graduates involved in these and other scientific developments, I have the pleasure of seeing past prophecies fulfilled, and am more than ever assured of a continuing rapid growth in all fields of engineering endeavor.

The technologies of aeronautics, electronics, automation, astronautics and their many kindred industries, great as they are today, will continue to expand with our exploding population and growing economy.

New methods of propulsion, new sources of power, automatic guidance and control systems, new metals and plastics, new methods of production and a host of other developments all emphasize the future growth of our technological industries and the great future they offer the well trained engineer.

Those of you who enter these fields fully prepared with a broad background of engineering education will have a distinct advantage. The type of young man so urgently needed today and tomorrow, is one with a comprehensive education—practical as well as theoretical. I have great confidence that the young men of America will keep this country abreast and ahead of other world powers in this vital scientific race. A sound training program, a keen, alert mind and a willingness to do an honest day's work in exchange for a generous day's pay will combine to assure a full share of the major awards of the future.

I am proud of the success and accomplishments of the thousands of Northrop graduates and will be watching, with equal interest, the achievements of future students.



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The Burden of Our Dreams

GILL ROBB WILSON
Publisher

WE SPEND our youth fabricating dreams and when they become substance by virtue of our toil and tears we spend our maturity lamenting the burden of them.

Once the sky was empty and we dreamed of filling it with wings:

"Saw the heavens fill with commerce,
argosies of magic sails,
Pilots of the purple twilight,
dropping down with costly bales."

Now the sky is full of wings—full beyond earlier imagining—full to the exclusion of earlier freedom—full not alone for us as a pilot but full for all human destiny. And, oh, how the burden of it chafes!

And the end is not yet—not by a "fur piece." Already the sky is the domain of the passenger rather than exclusively of the pilot—of the national freedom rather than of the individual freedom—of the security of mankind rather than of the airman alone.

This does not mean that we as airmen have no heritage which remains uniquely ours. It does mean that our heritage can be preserved only in relation to our adaptability to the utilization of the sky in its larger significance.

All who build frontiers, if they build well, arrive at this selfsame point. The open range gives way to fences; the trails give way to highways; the very rivers surrender their freedom to run untrammeled to the sea. Frontiers become the province of the many rather than of the few. And I ache as my grandfathers ached before me.

It is in the nature of things that transition from the old order to the new is a stormy process. Pride and privilege are stubborn qualities. Very little of all aviation organization is not vociferously self-serving. Thus, it is brittle to change and this is the seed of its ineffectiveness. Change is the irresistible force.

Down the road I can see it coming—not because anyone wills it to come, but because the momentum of logic is behind it.

The airport for example—the most ridiculous phenomenon of the air age—the only component of aviation to which aerodynamics has not been applied. Some day the major airport will be virtually a mid-city wind tunnel which will launch and receive aircraft free of the economic robbery of massive gear, traffic stacking, vast real estate holdings and time-consuming surface transportation.

Or the airplane for another example—some day each prototype of common carrier will take up its service to the public only after such a routine of FAA and/or military testing as determines its adequacy beyond conjecture.

Or pilot training—eventually, every pilot in scheduled commerce will be a graduate of a common airline school. Some day, authorities will decree that not age in itself, but age in relation to transition from type to type or even from route to route, is more nearly the crux of the matter.

And in this same connection, I perceive that aviation medicine, to use a loose term, is currently almost a vacuum in its practical application. Sometime, every pilot in public commerce at least annually will go through a thorough clinical examination such as many of us do already on our own initiative.

Some day the Air Commerce Act of 1938 itself will be recognized for what it is and changed so that the economics of air commerce have a chance for the center alley.

Within this decade we will inaugurate pilot training by instrument rather than visual reference. And what a revolution this will be—the recognition of weather after 50 years of killing ourselves in it!

During this period of transition, I should think FAA, as far as general aviation is concerned, might set up a deputy and perhaps a small regional field force for the sheer purpose of staying close to the great body of pilots unorganized in the grass roots. Government must lead the processes of change since it has that responsibility under law, but it can derive great benefit from grass roots' opinion.

General aviation is in a different category in relation to its contacts with government than is scheduled commerce or the defense air services. I gain the impression that improved liaison might be valuable.

In any case, the process of bringing order and reform will require five years in time alone and probably from three to four successive FAA administrations. No administrator short of that can expect to wear other than a crown of thorns, so vast was the confusion, so obsolete the machinery, so victimized by self-seeking pressures was the condition, when Congress stepped into the breech.

If the burden of our dreams now becomes reality in crowded skies, and sometimes seems to require more patience than we have, let us remember that we asked for it—nobody else—and it has been good to us. Where else would we have had so much satisfaction? Where else is there a better future?

Dear American Airlines:
I am the store coordinator for a nationwide chain. Name the airline and I'm flown it. For courtesy, service and expert pilot ability my hat's off to your line, the number one airline in my book.
Harry Hillard

AMERICAN AIRLINES

DIGNIFIED IN-FLIGHT LETTER FROM MR. H. HILLARD, NATIONAL STORE COORDINATOR, RAYCO AUTO SEAT COVER CO., PARAMUS, N. J.

Our Pilots, Mr. Hillard, are another of the reasons why American Airlines is first choice of experienced travelers. There are 1,750 of them; many are 15 and 20-year veterans—multi-million-mile Captains. Each follows a rigid apprenticeship with continuing company and government examinations. They are the elite of the Jet Age.

AMERICAN AIRLINES
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PACIFIC AIRMOTIVE

A corporate airplane gets flight-line service at PAC Burbank.

WIDENING ITS FIELD of operation in step with the growth of general aviation, Pacific Airmotive Corp. has developed during its 32 years in aircraft service, maintenance and parts supply capability broad enough to handle any work an airplane may need from the day it is sold until it is scrapped.

PAC can sell a customer a new airplane, then service and maintain it from tire changes through major overhaul of engine and airframe.

If the customer desires, PAC can do a major modification of aircraft up to and including the conversion of Convair 340-440 to Allison turboprop power. He can keep his airplane in PAC hands from Seattle to Los Angeles, from Honolulu to Chicago.

If the customer is interested in leasing instead of buying, PAC can furnish him with airplanes, engines, ground-support equipment, training aids or plant-support equipment.

PAC's unusually wide capability is spread through three divisions and five subsidiaries, with nine locations in the U. S., plus representatives of PAC's foreign operations in 20 countries.

Divisions of PAC, and their functions, are:

● Aircraft Services Division which, in addition to handling the usual service and maintenance work of a typical fixed-base operation, also holds sales responsibility for PAC conversion, modification and related large-job services. Headed by L. B. Littrell, who is a PAC vice-president, the division also has sales responsibility for Learstars and Grumman Gulfstreams, the two direct new airplane sales programs in which PAC is involved.

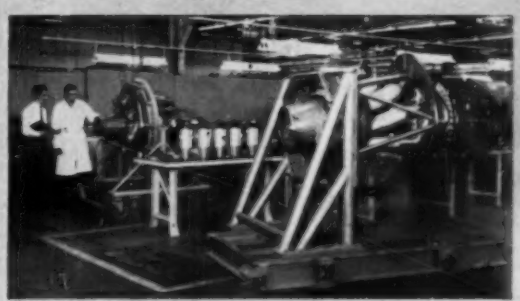
● Aircraft Engines, Accessories and Propeller Division, which overhauls these components. PAC currently is the only U. S. shop holding an FAA certificate to overhaul any piston or turbine engine in commercial use in the country today. Propeller work extends up through the Aeroproducts 606 props used on Lockheed's Electra and the Allison-powered Super Convair. Tom Lewis is manager of the engine division, as it usually is called, which covers all three overhaul activities.

● Aviation Products Division, with Jack Craig as manager, which handles sales of the aviation products of many manufacturers for which PAC is the distributor.

Both engine division and products division are under direction of Roy Backman, a PAC vice-president.

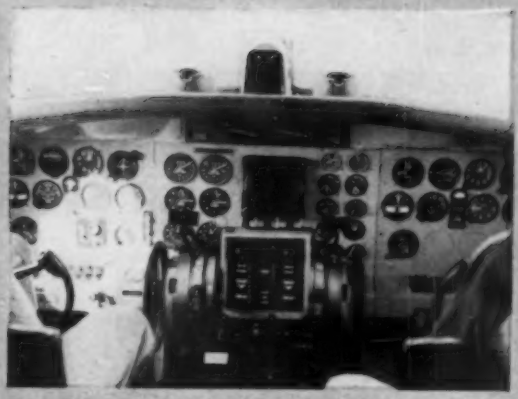
Four subsidiaries are wholly owned by PAC, while it holds a majority interest in the fifth. The subsidiaries and their functions are:

● Pacair, Inc., with Harry Wilmarth as president, is PAC's foreign sales agency, handling the various lines of merchandise for which PAC holds foreign rights. Where applicable, Pacair also sells PAC's services, including overhaul, modification and conversion. Another Pacair activity is sale of the converted North American Aviation T-28A trainer, for which PAC has the rights. Called Model 260 Nomad, the conversion increases T-28A's performance up to that of the T-28B. It was granted a type certificate on July 29, by the FAA. The aircraft will be sold to individuals who can afford to pay $40,000 for a high-performance sport plane, but primarily the aircraft is intended for foreign governments, such as France, which has bought almost 200 for use in the Algerian war.



Reassembling a Rolls-Royce Dart, at the PAC Engine Division.

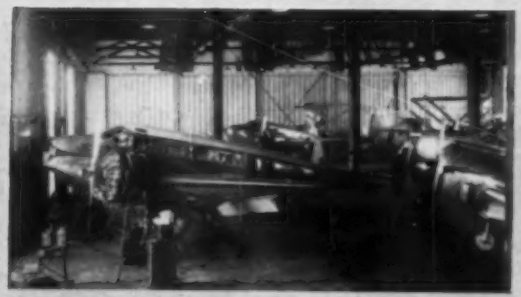
Below: PAC's headquarters at Burbank is center of far-flung



Super Convair panel—PAC conversion to Allison turboprop.

From Honolulu to Chicago, from Seattle to Los Angeles, PAC's extensive organization has a capability to deal with any work an airplane may need, from purchase until it is scrapped.

By RICHARD L. SWEENEY



Service Hangar following WW II. The firm is 32 years of age.

facilities that include three divisions and five subsidiaries.

● PacAero Engineering Corp., purchased some years ago from Lear, Inc., has the engineering staff in all design capabilities which enable PAC to sell major conversions and modifications. Design, engineering, fabrication and FAA certification of the Allison-Convair conversion was done by PacAero, which now does the manufacturing of the conversion, while Allison Division of General Motors holds the sales responsibility. PacAero has a division which does design and manufacturing of specialized technical products such as ground-support equipment, test equipment, training aids, etc. Formerly known as PacAero Technical Products Division, it now is called Flight Support Division, the name taken from a former PAC subsidiary located in New Jersey, and whose work this division now does. J. L. Fechter is PacAero president.

● Mid-Continent Airmotive Corp., with H. A. Smith as president, functions along the same lines as the PAC products division, and handles the same merchandise east of the Rockies that aviation products does to the west. With locations at Denver, Chicago, Tulsa and Kansas City, Mid-Continent has service facilities only at Denver; the rest of the sites are parts supply stores.

● Golden Gate Aviation, Inc., which is the Beechcraft airplane distributorship for northern California and northern Nevada, is kept as a separate entity, although it is a PAC subsidiary, and carries out those operations normal to a fixed-base aircraft distributorship. V. B. Benfer is acting president of Golden Gate.

● Pioneer Aircraft Leasing Corp., headed by PAC senior vice-president H. H. Greenwald (who also is responsible for the organization's creation), handles PAC leasing activity, including airplanes, engines, ground- and flight-support equipment, training aids, test equipment and other technical products. Formed just one-and-a-half years ago, Pioneer has doubled its net worth since inception and figures to play a prominent part in PAC's future. While PAC is the major stockholder in Pioneer, part ownership is held by interests now representing what was once Pioneer Air Lines of Texas, which contributed capital equipment (airplane engines) when the corporation was started, as its share of the initial investment.

PAC has another unit that has played a prominent role in operations in past years, its Chino, Calif. facility, where IRAN (Inspection and Repair As Necessary), modification and conversion on military airframes is done. Established in 1950, the Chino plant at times was a major contributor to PAC income. However, as bidding for this type work became even more competitive in recent years, PAC found this field less and less attractive. Last year PAC took on a military contract on which it suffered a significant loss. PAC decided to stay away from competitive bidding situations.

Currently, Chino is operating at a reduced rate, finishing a contract to overhaul F-86s for the Venezuelan government, to be completed in December.

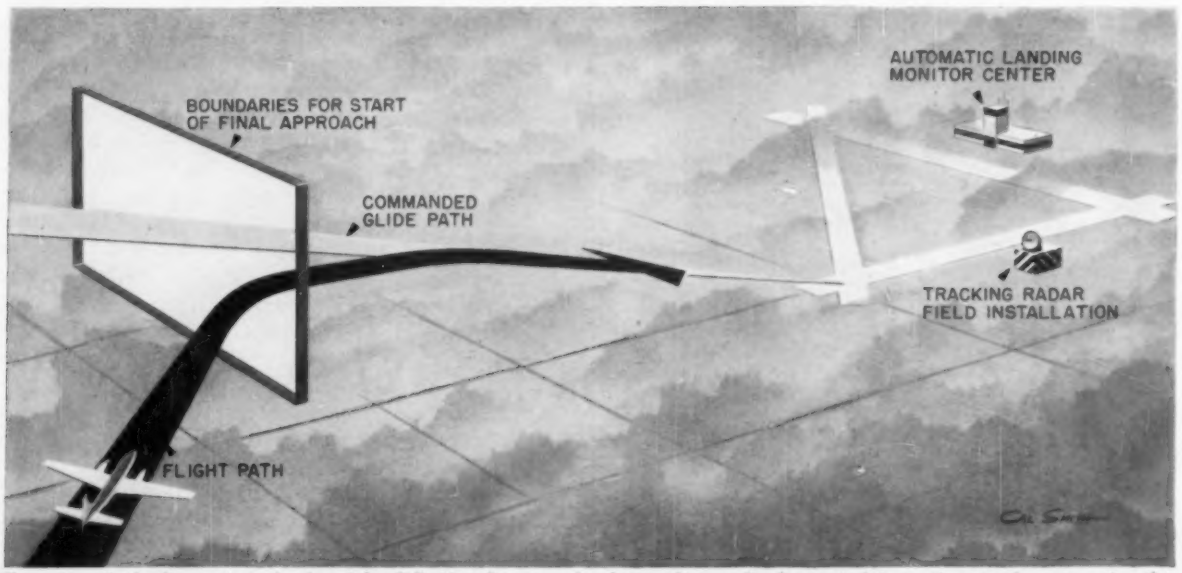
With its widespread corporate structure, activities and geographical locations, PAC board chairman John Meyers has moved to tighten administration and consolidate activities. One of the first steps was election of Robert L. Earle as PAC president in May, 1960, and Earle in turn is going ahead along the same track.

Among Earle's first moves (*Continued on page* 79)

Left: Ground portion of AGACS—automatic ground-air-ground communications system—as now set up at NAFEC. *Above:* Sequence console conveys information from computer to traffic controllers. *Right:* Operator of programmer's console checks ATC data on punched tape. In background is a digital computer unit which requires one-half second to search some 256,000 words in its "memory."

FAA's laboratory C-54 flies past automatic all-weather landing equipment.

NAFEC



The automatic landing system developed by Bell Aircraft uses radar for tracking, radio for control instructions to the automatic pilot.

Antenna of the REGAL system. The scissoring action helps provide the elevation control required for landing.

PART 1

Testbed for Tomorrow

By MYRON B. GUBITZ

On a 6,000-acre test site in southern New Jersey, FAA's National Aviation Facilities Experimental Center now has 600 scientists, engineers and technicians hard at work on projects affecting over 100 of aviation's most critical problems. A progress report on FAA's progress to date in automation.

IN THE FLAT, scrub-pine resort country of the southern New Jersey shore, there is a facility that is shaping the future of American aviation—the FAA's National Aviation Facilities Experimental Center.

To talk about the many needs of aviation today—improved ATC, better communications, approach and runway lights, all-weather landing systems, etc.—is rather like beating a dead horse. Anyone even remotely connected with aviation is all too aware of the pressing need for change and improvement. The Bureau of Research and Development of the FAA, however, is faced with the forbidding task of actually doing something about it.

When the FAA was born, less than two years ago, its Bureau of R&D (Research and Development) took over the 6,000-acre site of the former Pomona Naval Air Station and turned it into a vast laboratory, where the thousands of devices, systems and techniques being developed to alleviate the worst problems of modern aviation could be sorted out, tested and evaluated.

Today, NAFEC is staffed by about 600 scientists, engineers and technicians. Behind the seemingly quiet, tree-shaded facade of the base is a constant whirlwind of activity. More than 100 separate problems are being examined, ranging from the evaluation of fluorescent paint as an anti-collision aid to the broader question of how to bring a high degree of automation to our complicated air traffic control system.

With its own fleet of aircraft (running the gamut from a Tri-Pacer to a Grumman Gulfstream and a C-131), one of the best-equipped airfields in the world, and a wealth of electronic and other laboratory equipment, NAFEC's personnel are probing problem areas that relate to every phase of aviation—private and corporate flying as well as military and commercial.

NAFEC's first director was Colonel William S. Cowart, a dynamic R&D man on loan from the Air Force. He expressed the Center's mission this way: "Our job," he said, "is to take the Russian roulette out of aviation. We have a unique opportunity out here . . . to start from scratch, to bring in dedicated research and engineering people and turn them loose on the things that must be done."

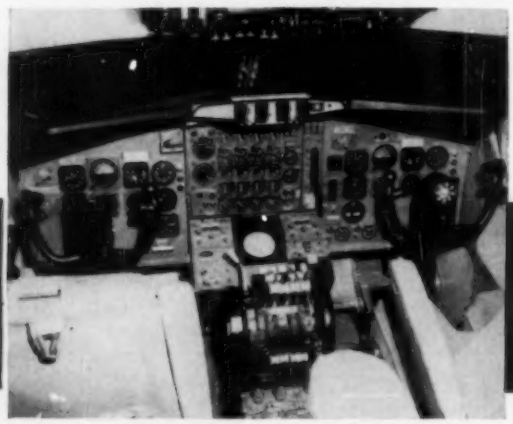
Colonel Cowart, since retired, and his successor, Colonel Aldro Lingard, foresee the future of NAFEC as an expanding one in which, as other agencies turn increasingly to problems of space flight and missilry, NAFEC will take on more and more research work in the field of manned aircraft.

For purposes of this discussion, we can divide the over-all NAFEC program into two broad categories: those areas involving some form of automation, and all other projects. This first section will deal with the automation projects; the second part of the survey will present a summary of the major investigations at NAFEC not involving automation techniques.

"Our philosophy is evolutionary," a leading NAFEC official has declared. "Automation is a must; but it has to be automation based on our present ATC system . . . increasing its efficiency and capacity. In the future, this may be the bridge to a totally new system, but not just yet."

Behind this push to automate the airways is the realization that air traffic con- (*Continued on page* 72)

The 10-foot-shorter fuselage is noticeable in this 720 operated by United Air Lines. United's configuration carries 97 passengers, plus 10,000 pounds cargo. *Below:* Flight instruments for pilot, copilot, are in basic T-configuration.



CHECK PILOT REPORT

MEDIUM-RANGE SPEEDSTER

Grossing less, and shorter than 707s and DC-8s but with lighter engines, the 720 figures prominently in the airline equipment picture. At this writing, 82 have been ordered.

By CAPT. ED MACK MILLER

Captain Ed Mack Miller, United Air Lines, is a 20-year pilot, an airline instructor-captain, and one of less than a dozen pilots in the world rated in both Boeing and Douglas jet transports. His flying time totals over 9,000 hours, of which over 1,000 hours were at the controls of jet airliners. In addition to the Boeing 720 and the Douglas DC-8, he is ATR rated in the DC-3, CV-340, and DC-6 and 7.

THIS ONE is a thoroughbred. It's the latest of a proud jet heritage that began with the B-47 and came down through the B-52, the KC-135 and the early 707. The systems are similar but the bugs have been bred out."

The man speaking was Tom Layne, veteran Boeing experimental pilot, who, with Jim Gannett, chief of Boeing's flight training department, had been assigned to check out a dozen United Air Lines professional flight instructors—of whom I was one—in the newest, fastest version of the 707 series, the Boeing 720, at San Francisco last summer.

As a United instructor who had spent the previous six months teaching "old pro" airline crews to fly the Douglas DC-8, I was not too happy with my transfer into United's Boeing program. The way I saw it, it wasn't possible to build a finer airplane than the DC-8.

But, as W. E. "Dusty" Rhoades, long-time United captain and manager of flight engineering says, the 720 handles so nearly like the DC-8 in flight that it is difficult to differentiate between the two.

Actually, the 720 bears a striking resemblance to the DC-8, for one of the most easily identifiable of Boeing

characteristics—the forward-pointing radio antenna on the vertical stabilizer—is missing on the 720. Although the 720 quite naturally also resembles its parent 707, it is 10 feet shorter in fuselage length (130 feet, 6 inches) even though it retains the same wing span (130 feet, 10 inches). Grossing only 213,000 pounds (the 707-320,-420 grosses 296,000 pounds) for maximum takeoff weight, the 720 is a "real goer."

You have to pull the power back when you level off at low altitudes, or the airspeed warning bell will be ringing within seconds.

The entire vertical tail assembly has been redesigned with both size and aspect ratio increased. The 720 also has a ventral fin, which serves both as an aid to stability and as a tail skid (the keel of the fin is capped by an inch-thick strip of maple planking).

The 720 has the same basic engine as most of the domestic 707s and DC-8s—the reliable Pratt and Whitney J-57. The engine on the 720 (called commercially the JT3C-7 series), unlike the JT3C-6 used on DC-8s and many 707s, has no water injection. The biggest difference the pilots notice is the quicker power response on the C-7 engine. This has been accomplished by redesign of the front rows of the compressor blades and by changes in the fuel-control unit. Nearly 1,000 pounds lighter than the JT3C-6, the C-7 produces 12,000 pounds of thrust at sea level.

Later versions of this fastest of current Boeing jet transports, to be designated the 720B, will be powered by four Pratt & Whitney JT3D-1 turbofans, each rated at 17,000 lbs. of thrust. These new powerplants discharge fan air at sonic velocity through ducts on either side of the nacelle. Reverse thrust is provided by a gill system which blanks off these ducts, forcing the discharge forward through rectangular apertures at the cowling fronts.

At this writing a total of 55 720s and 27 720Bs have been ordered by nine airlines, in addition to which Boeing will modify 10 of its 720s to 720Bs for American, with the installation of the new JT3D-1 engines. Rundown by airlines follows:

United has taken delivery of nine of its total order of 29 720s which will be converted. Eastern will take delivery of 10 720s starting in 1961. Irish Air Lines will get the first of its three 720s this month.

Avianca has ordered two "Bs" for 1961 delivery. Also scheduled for 1961 are 720Bs to Ethiopian Airlines (two), Lufthansa (four) and Western Airlines (four).

Designed for medium-range operation, the 720 can operate nonstop quite easily between Los Angeles and Chicago, and direct flights from Cleveland to the West Coast are feasible with a moderate sacrifice in payload. In United's configuration, the 720 carries 97 passengers plus 10,000 pounds of cargo, for a payload of about 31,000 pounds. Its eight fuel tanks hold some 13,500 gallons.

The 720 handles well through all regimes of flight. At high speeds, small inboard ailerons are used for lat-

THE BOEING 720

Photo of the 720 in takeoff configuration shows the unusual appearance of the leading-edge flaps. They shorten takeoff and lower landing speed.

eral control, with differential action of the wing spoilers also available for supplementary roll action. At low speeds, with the flaps extended to 20 degrees, the outboard ailerons (much larger surfaces than the inboards) come into play, as well as the leading-edge flaps, which are fully extended to 100 degrees plus when the main flaps pass the nine-degree mark.

Spoilers on both wings also can be activated simultaneously by a speed-brake handle near the captain's right hand. As the speed-brake/spoiler systems are interacting, the maximum rate of roll can be obtained with the speed-brake handle in the 20-degree position with trailing-edge flaps at 20 degrees. With hard-over aileron, the down wing would then have "full-up" inboard and outboard ailerons and 60 degrees of spoiler extension as well.

"Dutch-roll" characteristics (see box) of the Boeing 720 are the least troublesome of any of the 707 series. Instructors find it difficult at first to induce a good Dutch-roll condition for demonstration purposes, except at altitude where turbulence will make the plane "snake." Recovery, of course, is to turn the yaw damper on, which stops the roll immediately. With yaw damper inoperative, the recovery is taught using ailerons only.

Aileron control is so fast, in fact, that the insensitive pilot can set up "false Dutch-roll" just by over-activating or "pulsing" his ailerons. New trainees are amazed that the average roll-out lead on steep (45-degree bank) turns is only 10 degrees.

Biggest change over other 707 types is the "tall tail," which has full hydraulic boost. Loss of an engine on takeoff easily is controlled with only light foot pressure. In fact, Layne and Gannett recommend that the pilot fly the plane all the way around the pattern without trim because it is easy to hold, (*Continued on page* 84)

'DUTCH ROLL' AND 'TUCK'

Dutch Roll applies to a wallowing motion—characteristic of swept-wing aircraft—during which the aircraft rolls right and left around the longitudinal axis while yawing right and left around the vertical axis. Angle of bank and degree of yaw are dependent upon the amount of force applied in initiating the Dutch Roll.

Normally, the motion is caused by turbulent air or lateral over-control. The low lateral directional damping of swept-wing design allows the motion to continue at slow indicated airspeeds. Compensation for Dutch Roll is made simply by keeping the wings level. Another method is to apply cross-control. At low indicated speeds, flaps up or down, Dutch Roll will seem to be more pronounced. At high indicated speeds natural yaw-damping forces minimize or tend to zero out any such roll tendencies.

* * *

Tuck, or pitch-down, is a result of a gradual rearward movement of the center of lift on the wing as Mach number is increased and separation of the airflow over the wing occurs.

In the 720 the tuck tendency begins to occur at about .84 Mach; it is easy to control manually by control-column back pressure or nose-up trim change. With the Mach trim system operative, the correction is automatic.

The autopilot, when engaged, also automatically applies the necessary corrections to hold constant altitude or attitude, according to the autopilot mode that is selected.

Right: The two rows of vortex generators and the raised spoiler—inboard on the wing—here are shown extended. *Below:* Redesigned vertical tail—taller and of a higher aspect ratio—is quite evident.

PLACE IN THE SUN

This Tiger Moth of the English Luton flying club seems to make a pretty picture. But once-popular personal flying is fading badly in Britain.

By comparison to the British civil flyer, the American private pilot is the world's luckiest. Why? Read this article and see.

By OLIVER STEWART
Editor of the British "Aeronautics."

RESTRICTION and regimentation plague personal flying in Great Britain, while enviously we note that United States pilots remain the luckiest in the world. If they continue to find adequate place in the aviation spectrum amidst all of the demands for space aloft, perhaps here, too, we may improve our lot. That it requires a deal of doing for both them and ourselves seems a certainty. At the least, we must remain constructively articulate.

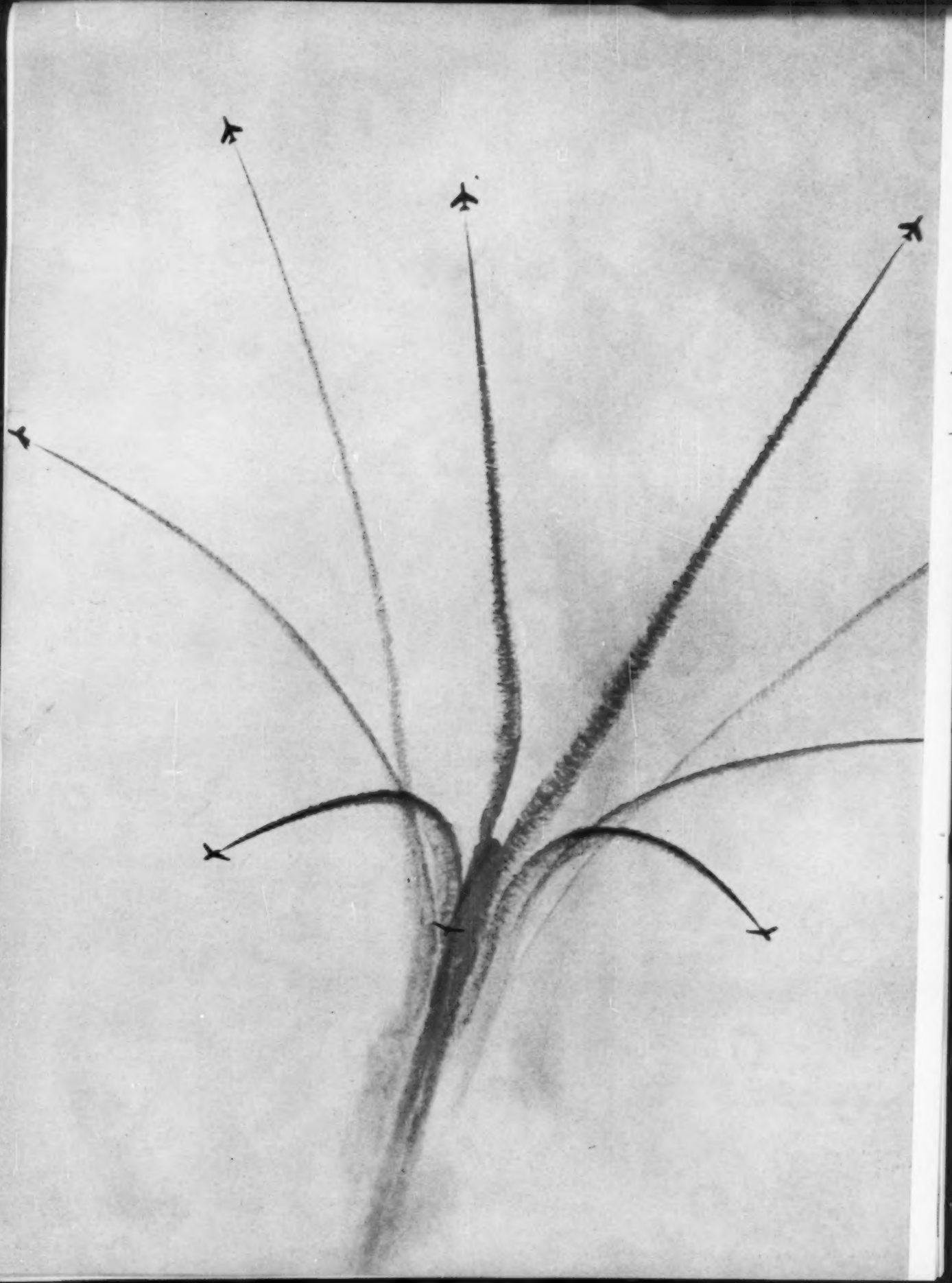
Between the wars personal flying in Britain soared to a peak of popularity and prestige. Now it seems sometimes on the point of fading away altogether. There are only 6,500 holders of private pilots licenses and about 750 club, training and private aircraft. They operate within a closely confined and regulated air space. We have no more Jim Mollisons to match your Max Conrad and others in long-range ventures.

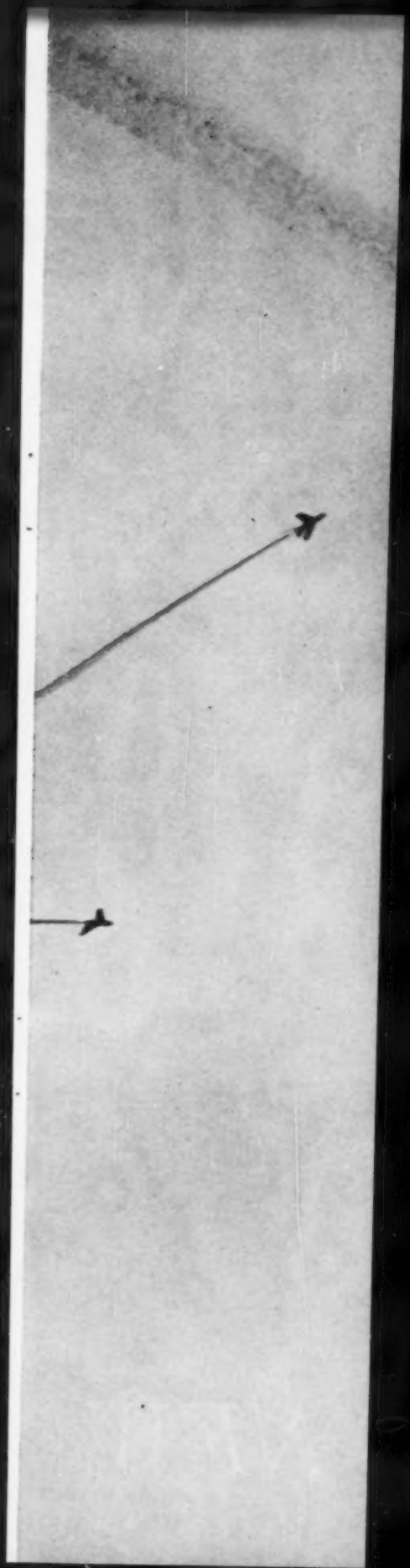
The regulations are closing in. Authorities who make them have the best of intentions. They are thinking of the safety of the public. Their method of securing it is to require that the weaker vessel give way to the stronger. This is a reversal of the rule of the road at sea where steam gives way to sail and where, even in crowded anchorages, there is almost complete liberty of action. Last year, in Southampton Water, the Queen Mary spilt a good deal of soup in her staterooms when she slammed to an emergency full-speed-astern to save a small sailing yacht which was crossing the deep-water channel.

Now, certainly none would hold that the traffic rules of the sea could be applied to air traffic in exact definition. But might not one be justified in holding that provision should be made for all in the air as it is on the sea. Certainly, the principle of safety is paramount in air traffic but does that mean necessarily that the pilot of the small aircraft must not only keep out of the way of the larger, but as well must keep away from anywhere that the big aircraft might fly?

Here is where British and United States practice differs. Small personal aircraft are forbidden to use England's airports except under special conditions. There is no personal flying at London or Gatwick unless a complicated and long-drawn-out initiation ceremony has first been completed. A more liberal attitude, I am assured, prevails in the United States where the airport is regarded generally as a service to the public not to be withheld from any aircraft without good cause.

Yet the traffic density in U. S. airports is such that it makes London look like a (*Continued on page* 94)





Happy was I to roam the sky when flight
was still the art to fly

Those wond'rous things of wood and wire
which met my every heart's desire;

With compass strap't to knocking knee and
weather what the eye could see

From cockpit open to the sun or to the
stars when day was done;

While if beset by storm or lost with
wings besieged by building frost

An ardent prayer and cotton patch was
combination hard to match!

When goggles, helmet, scarf and boot were
something more than antique loot,

When runways yet were tracks on sod and
no one in a tower was God—

To bid me pother here or there or hold
or climb or paw the air

Or keep me circling on my can in some smog
stacked up caravan

Before deciding on the town where I least
wanted to sit down.

Yes, happy I that I could fly before
they fenced the open sky

But, truth permitting nothing less, this
fact forsooth I must confess—

Despite that I have had more fun than is
deserved by anyone

I'd trade it all without regrets to get
my paws upon those jets!

The old time pilots never die. The aeroplanes
just pass them by.

GILL ROBB WILSON

CHECK PILOT REPORT

HILLER'S NEW

E4 "STATION WAGON"

By A. C. BASS

High performance, noteworthy comfort and easy handling of this four-place rotorcraft, powered by the Lycoming VO-540 of 305 hp, insure a promising future for the E4 in a growing helicopter field.

Opposite page: Formation of E4s. *Below:* Extended fuselage puts pilot forward of the three side-by-side passengers.

A customized interior created for Hiller by Bay Aviation Services—special upholstery, carpeting and soundproofing.

HILLER AIRCRAFT CORP.'S new E4 helicopter, the company's first four-place rotorcraft to enter the commercial market, combines high-performance flight capabilities with handling ease and "station wagon" comfort. These features were evident to FLYING's pilot-editor, in the first evaluation of the E4 shortly after it was certificated.

The E4 essentially is Hiller's basic 12E airframe, with the nose extended to accommodate a pilot in front of the standard three-place configuration. A constant cross-section extension, added to the body, provides support for the canopy, rudder pedals, instrument pedestal and flight controls.

List price of the four-place helicopter is $69,960. First production models will roll out at Hiller's Palo Alto, Calif., plant this month. The 12Es in the field can be converted to the E4 configuration at the factory or at an overhaul facility. Conversion kit is priced at $14,960. Installation at the factory runs an additional $3,740. Aside from the enlarged canopy and the pilot's seat, other kit features include a 125-lb. baggage compartment, a twin rear stabilizer and dual carburetion.

Weight of the E4 installation—which does not require a major modification—is 60 lbs. The weight is partially offset by the dual carburetion of the standard E4. Performance of the "station wagon" is about the same as that of the lighter 12E, and allowable gross weight has been increased from the 12E's 2,700 lbs. to 2,750 lbs.

Powerplant for the E4 is the Lycoming VO-540 rated at 305 hp at 3,200 rpm at sea level. The new dual Marvel carburetors, when installed, increase the basic weight of the 12E approximately seven pounds. However, they provide an additional 18 hp which is available above 4,000 ft. With this additional power the rotorcraft will hover in ground effect at 10,000 ft., out of ground effect at 6,400 ft., and will have a service ceiling of 16,500 ft.

The new power kits give up to 30 per cent more useable horsepower (Hiller emphasizes that the rotorcraft presently has the highest useable horsepower of any light helicopter). They consist of the two matched carburetors, an adapter to the engine manifold, a modified fibre-glass duct, and other parts.

List price of the loose kit, standard on factory-produced E4s, is $2,908. The installed kit price on new 12Es is $2,938. In both cases credit of $1,000 can be allowed when the single carburetor and fibre-glass duct are exchanged for the dual kit.

Later, a turbo-supercharger will be added to Hiller's list of accessories, which will produce the full rated horsepower of the VO-540 from sea level to 20,000 ft.

The recently certificated helicopter evaluated by FLYING was flown across the country by Hiller's chief pilot, Dick Peck, to the facilities of Aeroflex Corp. (a Hiller dealer) at Aeroflex-Andover Field, N. J. (See October issue of FLYING.)

The two-bladed rotor system and new tail are shown in this photo.

Field elevation of Aeroflex is 583 ft. At flight-time the weather was clear. Wind was from the northeast at five mph. Temperature at ground level was 80 degrees Fahrenheit. The E4 was fueled to its 46-gallon capacity. With three of us aboard the helicopter grossed out at its 2,750-lb. maximum weight.

After a thorough but rapid walk-around inspection, facilitated by the open construction of the fuselage, we strapped in. The pilot's seat, situated forward in the bubble, is comfort-adjustable in three positions with a variable angle of back support. The instrument panel is quite low to allow almost unobstructed sighting over it, yet angled forward, from its base, to permit the pilot a direct view of the instruments without having to alter his position. The plexiglas bubble offers excellent visibility and, in the production models, will be tinted to cut down glare.

The starting procedure is simple since the centrifugal clutch automatically begins to engage the rotor at 900 engine rpm. After the tachometer, engine and rotor needles "married," rpm was increased to 1,700 for warm-up. Following the run-up, all gauges were normal and we were ready for takeoff.

The hand-grip throttle on the collective pitch control was rotated to the left to achieve the maximum allowable rpm—3,200—for pick-up into a hovering flight condition. Throttle synchronization was excellent for the load imposed on the rotor system; however, the collective reaction was quite heavy on the initial pull. This is standard with the E4. A boost control has not been installed to compensate for the heaviness because it doesn't occur during any other phase of flight, and would not warrant the extra expense.

The power ratio required to maintain the hover in ground effect at the computed 2,000-foot-density altitude was only 82 per cent of the maximum allowable power or 21.5 inches manifold pressure (mp). This was excellent considering our proximity to maximum gross weight. As mp was brought up to 26.5 inches we moved off the ground cushion. Translational lift was picked up at an estimated 10 to 15 mph ground speed. (Airspeed below 35 mph has to be determined in reference to the aircraft's speed over the ground, in relation to the known wind, since the airspeed indicator does not give an accurate reading until the needle settles down between 30 and 35 mph.)

Climb-out was made at 54 mph indicated to check climb at the "best climb speed" for the aircraft. Without a rate-of-climb indicator on the panel, the altimeter was cross-referenced with the clock and enabled us to gain a fairly accurate estimate of 1,400 feet per minute. A very favorable performance factor.

At 1,000 feet we leveled off and the nose was lowered to pick up cruise airspeed. Cyclic position is set as desired with application of thumb pressure on an electric trim button at the top of the contoured cyclic stick. There is no manual leaning of fuel at altitude. Hiller has installed a compensator that automatically sets up the right mixture for the engine.

The collective was lowered to reduce manifold pressure to 21 inches after 80 mph was attained to maintain the cruise attitude. Throttle synchronization made any adjustment of the rpm unnecessary during this power reduction.

In flight there is no trace of heaviness in the manipulation of the collective. Ballast weights on the rotor head change collective loads mechanically, allowing smooth, easy application of (*Continued on page* 54)

The E4 hovering for the photographer. Production models will have a tinted canopy to reduce glare. Hiller has kits to convert E3s to E4s.

Promotion to get new customers and keep the old need not mean complicated, expensive plans. Simple ideas—like these—offer a sound basis on which an alert fixed-base operator should build.

HOW TO... BRING IN THE BUSINESS

By CHARLES SPENCE

UNLESS yours is a private airstrip, you are operating an airport either because you love aviation or because you want to make a living. Probably both. But, whether you're working for love *or* money, the only way you can make it permanent is to bring in the business.

This can be easier than you may suspect.

Promotions, advertising, public relations—the methods for attracting new customers and keeping old ones—is not a mystic, magic world of mumbo-jumbo which many of its practitioners would have you believe.

The corner grocer who gives a lollipop to the child of a customer, or the baker who puts 13 cookies into a bag when a dozen is ordered, are practicing grass-roots promotion. And, there's not a fixed-base operator around who can't afford, or can't produce, this particular type of sales promotion.

A first key is to have the right public relations. This is where you will hear a word familiar to every flyer: attitude. In your instruction you stress to the student that the attitude of the aircraft should be of constant concern. So it is with the attitudes of your public. Just because you are in existence, there will be attitudes formed about you. To keep the business coming in you want to strive for the *correct* attitudes.

Stripped to its bare essentials, good public relations is nothing more than doing things in such a way that your public will approve, or at least understand. It is good manners applied to business and then magnified through communications. It is courtesy and concern. It is politeness and proficiency. It is thinking ahead of your customers; anticipating their needs and desires and planning to make it easy for them to do business with you. It is not trying to *sell* something—but rather *helping people to buy.*

When you have the attitudes trimmed up, it's time to start the sales promotion program, the lollipop and the 13th cookie. In this field, the techniques are not as important as the ideas. And, no one has the corner on the market of ideas.

Want to try a few in your operation?

First, let's decide what our goals are. Why do we want ideas? More students? Greater air taxi service? Increased transient business?

Let's start with the students. Where will they come from? Colleges? High Schools? Friends of present pilots? We have started to define our markets and zero in on the prospects.

It takes nothing more than a notice on the bulletin board to start having your present customers bring in friends to become students. But, give them a reason and incentive. One new student could be worth 10 gallons of gasoline for aircraft owners or one-half hour flying time in a rental ship. The more new students a present customer brings in to you, the more valuable his awards become.

If there are enough present customers to make it financially feasible, put up a major award for the one who gets the most new customers. This could be a weekend at a resort where you have an air taxi agreement. Set a deadline for the offering of incentives to encourage prompt action. And, list the names of new students along with their sponsors on the bulletin board. Not only does this give recognition for those who produce, it also acts as a friendly needle for joshing nonproducers into the act.

A variation of this would be offering to hold a hangar party for all customers who sponsor a new student. By including the new students and putting a touch of the theater into it—like staging a photo of placing paper wings on each student— (*Continued on page* 64)

Baby Ace. Built by Eddie Dunn of Bay Shore N. Y. Span 25 ft. 9 in., a 65-hp Continental.

Warwick Tiny Champ. Builder, Bill Warwick of Torrance, Calif. Span 20 ft., 65-hp Continental.

Sweet Patootie. Built by Ed Hoffman, Tarpon Springs, Fla. Span 19 ft., 65-hp Continental.

Thunderbird. A neat biplane by Leon Pope of Roseville, Mich.; 100-hp Lycoming, span 18 ft.

Midget Mustang. Sport-racer built by Robert Bushby, Dalton, Ill.; has 90-hp Continental.

EXPERIMENTAL

Clipped wing, aerobatic Taylorcraft flown by stunt pilot Duane Cole, 65-hp Continental.

Salvay-Stark Skyhopper, owned by J. McCann of Orlando, Fla.; 25-ft. span, 65-hp Continental.

TO THE MEMBERS of the Experimental Aircraft Association, the annual Fly-in is an occasion for a showing of the products of their handiwork, to demonstrate the workmanship and performance, to discuss design and construction details with experts in the field, and to meet old friends. This year, the event took place at Rockford, Ill., attracted 97 home-built airplanes, plus 25 antiques, from every cor-

A rare bird. Midget Flying Flea, built by Frank Easton, Salem, O., 40-hp Continental engine.

Curtiss Junior of 1930 vintage. Owned by Henry Kasper, Dixon, Ill., 40-hp Continental engine.

Smith Miniplane. Exceedingly popular with homebuilders, has 125-hp Lycoming engine.

Stits Flut-R-Bug. Builder, Orvel Yarger of Edgerton, O. Two-place, 65-hp Continental engine.

Joan Trefethen of Los Angeles, Calif. flew over in the Stits Playboy which she built.

M1 Cougar. Fast cabin monoplane, built by R. Benckendorf of Streator, Ill.; 108-hp Lycoming.

Aeroflyte DGH-1, Bensen Gyrocopter, built by Aeroflyte, Inc., Marion, Ill.; 70-hp McCulloch.

Lowery-Roakes KT-140 Knight Twister, powered by a 140-hp Continental, has Cessna-type gear.

DH Tiger Moth, owned by Rev. John MacGilvray, RCAF chaplain from Prince Edward Isl.

AIRCRAFT FLY-IN

ner of the U. S., with one entry from Canada. More than 1,000 members attended. On the fourth and last day, Rockford tower handled 1,796 operations, 90 per cent of them without radio. Heading the Fly-in was E.A.A.'s president, Paul Poberezny, whose untiring work for the cause of homebuilders made it one of the most significant achievements in private aviation. The association has 9,000 members.

Chuparosa, unusual biplane built by Raymond Hegy of Marfa, Tex.; a 65-hp Continental.

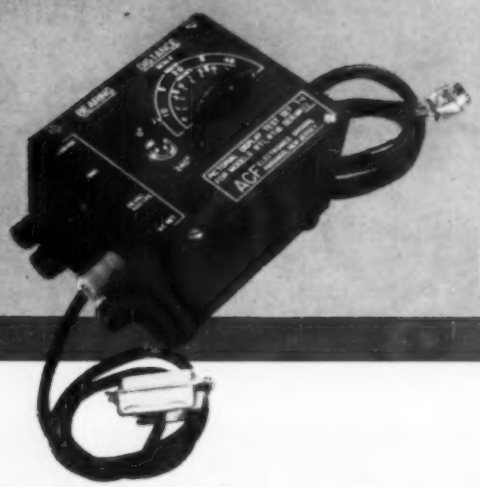
Tindall JT-1 has dummy machine guns. Tip-plated wings span 26 ft.; 65-hp Continental.

Modified for aerobatics by stunt pilot Harold Kreier, the Great Lakes has a 185-hp Warner.

Half-scale Curtiss Jenny, powered by Model A Ford, took first place in Fly-in's static display.

Wittman Tailwind, built by Ed Todd of Madison, Wis. Powerplant is a 150-hp Lycoming.

Baby Ace equipped with tricycle gear. Builders, J. Rogers and C. Grow, Swansea, Mass.



Above: Typical slide map—800 would cover entire country. *Left:* Required map is convenient to insert. RT-1 version accommodates a roll of 80 maps. *Below:* By means of this special test equipment the accuracy of the azimuth and distance features of the display can be checked out individually in the cockpit of the airplane or in the shop.

ACF INDUSTRIES' new pictorial navigation display—a compact, electro-mechanical device—"shows" the pilot his exact position, at all times, along his flight path. Its greatest potential will lie in a more efficient utilization of air space.

Geared to commercial and business aviation markets, the primary "all-weather" flight instrument is produced by ACF's Electronics Division at Paramus, N. J. Additional advantages evidenced during a flight evaluation by FLYING included:

- Used in conjunction with transponders, Air Traffic Control could monitor the flight in relationship to other traffic, while the pilot is able to monitor his own flight path in the cockpit.
- The pictorial display would cut down voice procedures and open up three or four additional routes that could run parallel to existing airways. This would negate aircraft, flying at variable speeds, from using the same routes and check points.
- Destinations could be flown to more directly, without costly stacking and holding delays.

Two completely self-contained models of the display have been designed by ACF: the RT-1, containing a continuous role of approximately 80 maps, and the RT-1B, which employs individual map slides. List price of the units is $4,200.

The RT-1B, the smaller of the two, was used during this evaluation. It is six inches square, two inches deep, and weighs but four pounds. The RT-1, by comparison, has an additional inch-and-one-half of depth, and weighs five pounds. Both are transistorized and operate from existing FAA or TACAN facilities.

The maps, supplied by Jeppesen and Co., Denver, are printed on transparent mylar and are specially edited for the display. As G. B. Shaw, general manager of the Electronics Div., pointed out to FLYING, "This is the smallest effective display unit ever built."

Here's how the display operates. Beneath the map an orange-colored reticle or "bug," representing the aircraft, moves freely along a rack and pinion in response to bearing and distance information provided by VOR/DMET (very-high-frequency omnirange/distance measuring equipment) ground stations and taken by receivers in the aircraft. Constantly changing signals position the

With this unit a pilot always can visualize his exact position.

ACF PICTORIAL NAVIGATION DISPLAY

By CHARLES BRITT

In RT-1B version transparent slide maps are inserted from top. Free-moving "bug" represents the aircraft. Track information is supplied by ground station at center of selected map.

"bug" in synchronization with the ground track being flown. At the center of the map is the selected VOR/DMET station, and magnetic north is always "up" in the unit.

Before getting into the evaluation, let's note that at a recent meeting of the International Civil Aviation Organization VOR/DMET was adopted as a world-wide standard until 1975. FAA has combined VOR with military TACAN for commercial use and has designated it VORTAC. While VOR has been more than established as a primary navigation system—not only in commercial aircraft but also in over 61 per cent of all utility aircraft with two-way radios—DME is relatively new and expensive.

This situation is expected to be altered by the end of 1961, however, when Narco, under FAA contract, is due to release a low-cost DME receiver. ACF, of course, is quite interested in progress along these lines since a relatively inexpensive DME would enhance the marketing potential of its pictorial display.

In evaluating the display ACF's Aero Commander 520 was used. The unit was mounted on the emergency pump handle between the pilot and copilot seats. (A knee-pad arrangement also is available but was not used for the test.)

Takeoff was set for 7:30 in the evening from Teterboro Airport, N. J. The weather was marginal VFR with scattered thunderstorm activity throughout the area.

Our flight plan was set up to allow the evaluation to undergo two distinct phases. The first called for employment of the display during normal en-route procedures under IFR conditions. The second was to be instrument flight in a terminal area.

Since the display is certificated only as a supplementary navigation aid, IFR conditions were simulated while the unit was being evaluated. (FAA certification, as a primary aid, is expected by early 1961.) Charts of the Solberg and Atlantic City areas were pre-selected and indexed for ready insertion into the unit as they were needed.

Immediately after clearing Teterboro's runway 24, the Solberg VORTAC was tuned in and the 20 mile-per-inch Solberg chart was inserted. Since VORTAC is dependent upon "line of sight" for accurate inputs we climbed out to 2,500 feet, although readings can be obtained lower in unobstructed areas.

Due to our distance from the station, in relation to the chart scale and altitude, the reticle searched the map in an effort to gain our correct bearing and distance. In this disoriented condition a black-and-white-checked indicator, located in the unit's lower right-hand corner, warns the pilot that there is either a gross error or that the moving reticle has not as yet locked on to the selected frequency.

As the reticle oriented itself and began tracking, the checked flag rotated to white indicating that we were locked on and the unit was operating normally. The reticle placed us 43 miles and 60° from Solberg. In order to check the accuracy of the ACF equipment we altered course to cross the (*Continued on page* 56)

EXERCISE BRIGHT STAR PINE CONE III

By LOU DAVIS

Testing the Reserves, MATS, Army and TAC in the largest combined-forces exercise since WW II, this USAF war-game included an airlift of over 10,000 men.

IN MARCH 1950, Louis Johnson, then Secretary of Defense, proclaimed that we were wasting too much money on expensive training exercises and airplanes. The remarks were made as he watched joint-services war games—Operation Portrex—on Vieques Island, off the eastern tip of Puerto Rico.

Three months later the North Korean Reds crossed the 38th parallel to ignite a fierce local war that was to catch us ill-equipped, to take the lives of 30,000 U. S. troops and to cost us heavily in equipment. Here again, General Louis Johnson (ret.) and his verbal chorus of political supporters implied that our weakness was due to a delinquent military command, one that had failed to maintain an efficient, ready fighting force.

In the heat of battle against the Reds, gibes against Portrex were soon forgotten and all hands turned to the task of meeting the emergency. However, the Puerto Rican exercises which included the Army, Navy, Marines and Air Force paid off handsomely by providing a timely rehearsal before the fire broke out.

National defense is a deadly serious business. Military management must have the freedom to administer the nation's "police" or "fire-fighting" force in the most efficient business-like way. Artificial incentives and organizational exercises are vital to holding the highest level of combat proficiency during peace time.

Operation Bright Star / Pine Cone III, a massive air reserve and active airborne troop maneuver, was staged recently at Fort Bragg, N. C., from August 13 to 27. This was the largest combined-forces exercise conducted since World War II. The Air Force Reserve, Military Air Transport Service and Tactical Air Command airlifted more than 10,000 U. S. Army airborne troops to the operations area. Battle groups and equipment were dropped on schedule with unbelievable safety and reliability. The maneuver was an outstanding demonstration of the Air Reserve's ability to render emergency airlift of a complex and high-speed nature, and to deliver mobility for a highly trained and ready battle force.

This maneuver was designed to meet small war or "brush-fire" war dimensions. It was predicated on the fact that our present USAF-MATS airlift capability is limited and would be sorely strained to satisfy tactical assault airlift and still provide long-haul pipeline transport to an overseas scene of trouble. It was also assumed that a small country, called "Platka," was under siege from a dictator-controlled neighbor to the north and that Platka called for aid from the U. S. The assumed long-range airlift distance was 3,000 miles.

The largest airlift force available for tactical missions today happens to be concentrated within the Air Reserve units. This capability, amounting to 25,000 men and 700 airplanes, has never been integrated into a combined maneuver to test its mettle or to evaluate the problems associated with its use. Thus, 530 C-119 Boxcars from 15 widely scattered reserve wings drew mission assignments to Pine Cone III. In addition to the Air Reserve, 115 aircraft and necessary personnel from the active Air Force were assigned assault and support roles. Tactical Air Command supplied 80 planes—C-123s and C-130s—for support and assault missions. Military Air Transport Service, utilizing 35 C-124s, performed the long-haul troop and supply movements as it would do in a real brush-fire war.

Combat fighters and reconnaissance chores were assigned to the Air National Guard. Jet squadrons numbering 82 planes (Republic RF-84Fs, Martin B-57s, North American F-100s and Lockheed F-104s) came from New Jersey, Virginia, Massachusetts, Georgia, Mississippi, Wisconsin, New York, Tennessee and South Carolina.

U. S. Army (*Continued on page* 101)

Paratroopers descending from aircraft that included 530 C-119s, 35 C-124s and 80 C-123s and C-130s.

A truly memorable experience awaits the airman who goes down to San Juan via the Bahamas and the island chain from Nassau to Puerto Rico. Here is an expert briefing for single- and twin-engine pilots. How to plan a safe air trip and an inspiring vacation.

FLYING THE CARIBBEAN

By ALLEN C. MINER

Left: Twin-Beech and Travel Air used for transportation of guests by a Puerto Rican hotel. *Right:* Scenic northern shoreline, to the west of San Juan. Dorado Beach Airport Club is at the center of the picture, the Club's paved strip at upper right.

WHAT vacation-bound airman hasn't felt the call of the islands—the Bahamas, Puerto Rico, Antigua, Martinique, Trinidad and countless other bright green spots dotting the azure sea? From Florida, start with us and see for yourself.

The heading is southeast from Fort Lauderdale out over the blue Gulf Stream. A dot appears to the left and moves closer—Bimini, first of the Bahamas—myriad shades of green, blue and aqua sparkling from the shallow crystal-clear water, and the farther out one goes, the more beautiful the surroundings become.

Finding one's way about in private aircraft in the Caribbean is easier than generally surmised. Weather in itself is seldom a problem. VFR flight is entirely practical throughout the year except for brief showers which usually can be detoured with little difficulty.

While multi-engine aircraft are the more feasible for island flying, many single-engine craft are utilized when proper planning and necessary precautions are affected.

The prime requisite is sufficient range. This limits single-engine craft to such types as Cessna 172s, 182s, Bonanzas, etc. Small aircraft of any description, however, may be fitted with extra tanks, ADFs and the necessary radio equipment to travel these long distances.

The chain of islands between Nassau and Puerto Rico is largely undeveloped and of no significance for the vacation-bound pilot except for navigational purposes and refueling. This excludes Cuba, Haiti and the Dominican Republic. Because of governmental unrest in these countries and the requirement of prior approval in writing, stopping here has posed extreme difficulties and delays in the past year. It is often necessary to apply months prior to a proposed trip in order to secure clearances in time, and even if these are obtained, it is possible to find that upon arrival officials do not recognize these as being sufficient.

Before departure, many details must of necessity require a pilot's careful attention: filing a flight plan, checking weather and procuring maps, and not the least of these, clearing customs and immigration which varies according to proposed stops en route.

When planning flights over open water, flotation gear and survival equipment is a must. Since this equipment often is quite expensive, most pilots find that rental is both economical and satisfactory. Such gear is available at both Fort Lauderdale and Miami at very reasonable rates. A five-man life raft, a Gibson-girl portable radio and five Mae Wests can be rented for approximately $17.00 per day. Although many will feel the former is being too cautious, one Mae West per person is minimal. A little raft may take up what one feels is valuable baggage space, but (*Continued on page* 96)

BOWMAN FIELD
America's busiest local-traffic airport

More than 175,000 aircraft movements per year distinguish this unusual airport in the bluegrass region of Kentucky. What is the secret of its success? What factors contribute to this record? The answers point up valuable lessons for operator and pilot.

By CECILE HAMILTON

WHY DOES Bowman Field at Louisville, Kentucky, have the heaviest local traffic of any airport in the world? The question had been haunting me ever since I did an analysis of air traffic for FLYING's 1958 annual business-flying issue. When I first came across the fact while breaking down statistics contained in the FAA's "Air Traffic Activity" study, it was difficult to believe that its local aircraft movements totaled 175,266 in 1957. These figures have not changed significantly since then.

Second place for local traffic had gone to Anchorage, Alaska's Merrill Field with 155,005 operations. While amazing, considering that Anchorage has an area population of only 40,000, this still was reasonable in view of the universal use of airplanes by Alaskans. Third, fourth and fifth places went to large metropolitan area airports—Kansas City's Fairfax; Teterboro, N. J. in the New York area; Santa Monica in the Los Angeles area. But why Louisville for first place?

Certainly the city was not known as an "aviation center"—no aviation industry, no major aircraft service bases. But then, Bowman's top ranking status was for local traffic, not itinerant.

As defined by the FAA, "local" traffic is composed of takeoffs and landings of locally based aircraft for flights which remain in the general area of the airport. "Itinerants" are planes coming from or going to another airport. So local traffic would have to be primarily flight training and practice. But why Bowman Field in Louisville? I'd never heard of any mass training going on down there. And why should Kentuckians be so all-fired interested in flight training?

Since the article written in 1958 concerned "The Pattern of Aviation" and the Louisville item had represented an off-beat angle that didn't seem to fit any known patterns for aviation development around the country, I had promised we would look into the matter at a later date. However, opportunity did not present itself for such a study until recently.

Situated on the eastern edge of Louisville, Bowman's elevation is 549 feet; its three concrete runways are 100 feet wide and 3,600, 3,700 and 4,350 feet long. The control tower transmits (as of August, 1960) on 278, 119.5, 121.5 and 126.18. Louisville VORTAC is nine miles southeast of Bowman. Standiford, the airline and military airport, is about four miles southwest of Bowman and has ILS and DF.

Service listings show 80, 91 and 100 octane, full A & P, radio and instrument service, restaurant, district FAA airman's branch office, FAA communication station, direct phone to weather bureau, four fixed-base operators, courtesy cars, auto rental, city bus and taxi.

Squaring away at Nabb omnirange some 25 miles north of Bowman on a hazy but sunny August Sunday afternoon, I called Louisville approach control to give my position and received reports of several planes in my

On the eastern edge of Louisville, Bowman uses grass as well as paved runways and simultaneous landings of three aircraft are not uncommon.

area. Continuing on a radial of 182 degrees from Nabb, I switched to tower control while crossing the Ohio River five miles north of Bowman.

Runways stood out clearly in the haze, the field looking neat and well kept with a fine stand of Kentucky bluegrass between the runways. Close to the city, it is bordered on two sides by a public and a private golf course, on the others by a park and attractive residential areas. There are five large hangars, an administration building with tower, and in one corner a number of World War II barracks-type buildings among which are two rows of T-hangars.

Traffic in the pattern consisted of 10 to 12 planes including two light twins, the remainder being single-engine types from trainers to deluxe four-place jobs. Judging from the tower talk going on, almost all were using some type of two-way radio.

Cleared to land on runway 24, I came into final approach with a Bonanza off my right wing and a Comanche off my left. They also had been cleared to land and, while I didn't know what they intended to do, being in the middle I was heading for the center of the runway. We made a fine formation of it, the other two planes touching down gently on either side of me in the grass areas.

One piece of the puzzle had fallen in place—though the traffic might be heavy, there were no one-way runways to bottleneck it and cause go-arounds. These were three-way runways. In fact all of the turf area of Bowman is available for landings.

Not knowing which of the four operators on the field I should go to for hangar and fuel, I asked ground control for directions to the Cessna hangar. This was directly across the field from my position at the moment where I had turned off on a taxi strip. I continued ahead onto a wide hardstand, planning to circle around the field, but was soon clattering across hundreds of metal tie-down rings, leftovers from wartime installations. Ground control informed me I could cut directly across the turf, the full field being available for taxiing. And man, was this Kentucky bluegrass smooth! I later learned they never have to roll it, seldom have to mow it, and get good seed crops from it.

Pulling up to the Cessna operation, Kentucky Air Transport, I was informed there was no hangar space available there or at the adjoining two hangars of the Piper distributor, Louisville Flying Service. A lineman suggested taxiing to the hangar just east of the tower, Central American Airways, where space might be found. Cutting the throttle in front of Central's flower-bordered office, a lineman said they had room for my Cessna 175 and helped unload the baggage into a courtesy car provided by the manager.

Central's office and pilot lounge were modern, comfortable and air conditioned. Excellent overnight accommodations were reserved at (*Continued on page* 89)

SCAT

Safe Flight's new, easily read instrument gives a precise reading on aircraft attitude both during takeoff and approach, enabling proper use of elevators and use of power to offset emergencies at critical periods.

SPEED CONDITION—APPROACH/TAKEOFF

By GERALD J. SCHLAEGER

A JET BOMBER swung into position on the runway. As the pilot applied full power it began to accelerate slowly, but at an ever-increasing rate. Near the halfway point on the runway the pilot raised the nose and the bomber became airborne. It lifted to six feet but would go no higher; it did not accelerate. He raised the nose further but this only aggravated the already untenable condition.

The runway passed behind and the bomber crashed when it could not avoid obstructions in its path. What caused this aircraft to fail in its attempt to fly?

As the airplane had accelerated on the runway and approached the rotation point, the pilot had raised the nose too soon, and too high. The plane became airborne, riding on a layer of compressed air between the wings and the ground. This is known as "ground effect." Flight can be maintained here with much less power than required in free air without this cushion of heavy air. As the pilot further raised the aircraft's nose the induced drag increased all out of proportion to the additional lift due to the increased angle of attack. He was in the area of reverse command, behind the power curve. The power requirement rose beyond the capability of the engines. From this point on, the plane could fly only in ground effect so, when obstructions confronted him the pilot could do nothing to avoid them.

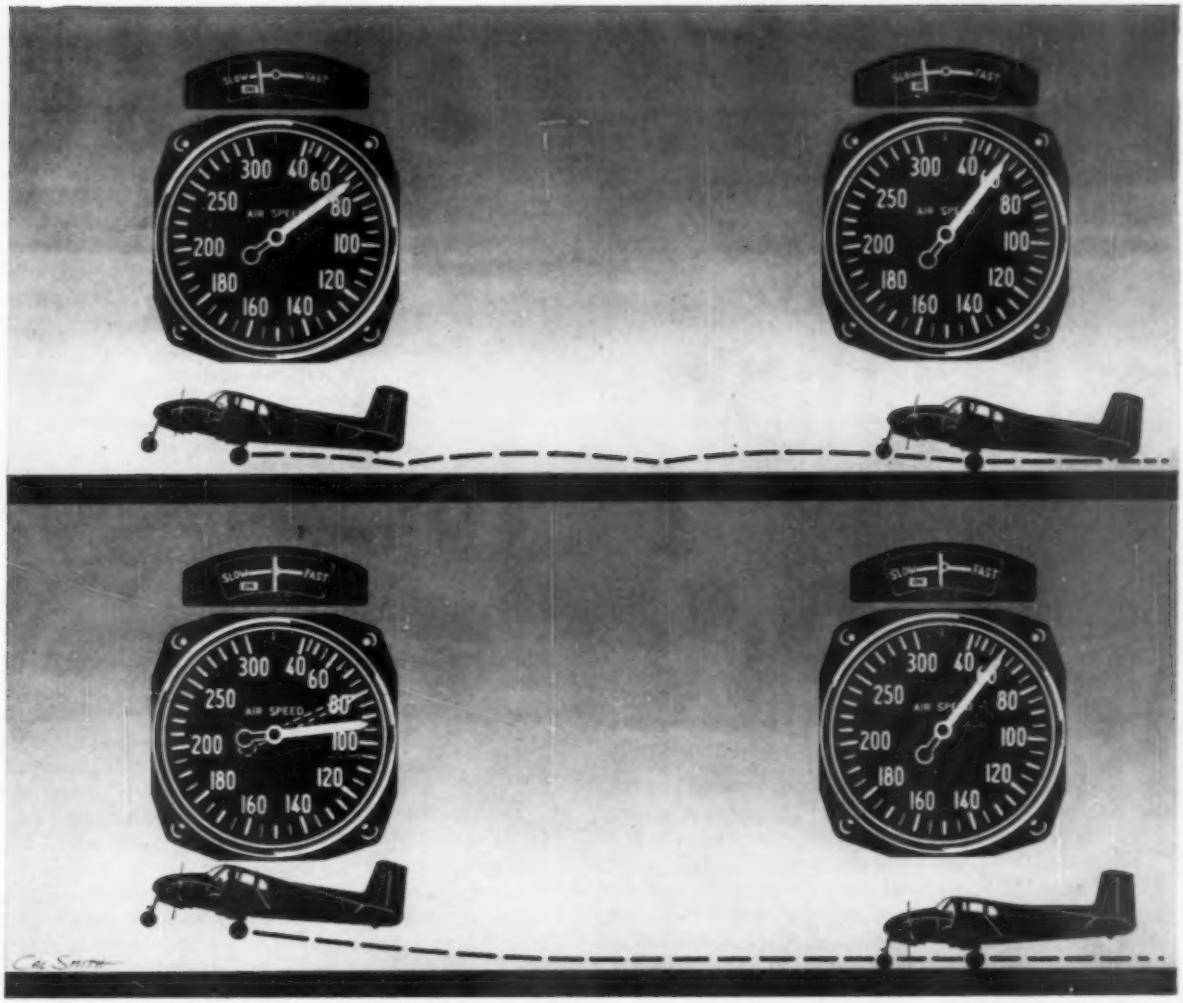
He could have made recovery by lowering the nose and thereby attaining a more appropriate angle of attack, even at the expense of making ground contact. This action would have permitted the bomber to accelerate to full-flight condition. At a speed of three-miles-a-minute; second guesses, and concrete, are at a premium.

As we move into the high-performance, swept- and delta-wing jet aircraft, the speed at rotation, and degree of rotation, becomes increasingly important. Over-zealous World War II B-25 pilots frequently struck the tails of their airplanes on the runway during short-field takeoff practice, yet climbed merrily away. The excellent low-speed thrust of the propellers permitted it. The jet does not have this advantage.

Slush, snow or even water on the runway may be "judgment warpers" and cause the pilot inadvertently to raise the nose too soon and too high in an effort to reduce the runway drag, only to achieve the more insidious induced drag from the higher angle of attack.

Proper determination of rotation time and attitude has long been a problem to pilots. Various techniques have been utilized from time to time. Different agencies have favored their own particular method. The nose may be raised on takeoff at a pre-determined indicated airspeed, usually V2 minus ten knots. How high is an educated guess. From this point until the airspeed is settled down there is no reference except the flight indicator because the altimeter and the vertical speed indicator are yet in a state of instability. They may, and usually do, indicate at rotation a descent prior to a climb due to the flow of air over the static ports. The airspeed is primary for pitch.

This worked fine as long as the aircraft was equipped with the vacuum-driven artificial horizon which had very effective erecting mechanism. Now we are faced not only with extreme attitude changes and long acceleration periods of the big jets, but in addition, the electric-driven flight indicators can show as much as five or six degrees of upward pitch acceleration error. Even



Top: SCAT indication during purposely over-rotated takeoff at too slow a speed in a Twin-Bonanza. *Above:* Keeping the slow-fast needle centered, the aircraft then smoothly achieved the predicted climb speed, when rotated at appropriate takeoff airspeed and power setting.

those with electronic erection which is muted during periods of acceleration, to reduce this error, are so scaled that rotation attitude places the miniature aircraft too far from the horizon bar, precluding accurate interpretation. There simply is no adequate pitch instrument for the period immediately following rotation. Engine malfunction or failure during this critical period increases the burden on the pilot to super-human proportions. The "by guess and by gosh" has just about reached its final limits. Certainly, a requirement for more suitable instrumentation is evident.

In White Plains, N. Y., the Safe Flight Instrument Corp. took the challenge and came up with a new flight instrument which promises to satisfy the need, not only for appropriate takeoff attitude information, but for proper approach attitude as well. It is called SCAT, (Speed Condition-Approach/Takeoff).

SCAT is designed to take angle-of-attack information (lift ratio, CL/CL Max.), integrate it electronically with acceleration information, and present it on a single, easily read instrument to indicate speed condition (slow-fast) relative to an optimum point for that precise moment. In so doing, it provides accurate and current information for proper use of the elevators during takeoff (max. power) and proper use of power during an approach. In other words, it effectively tells you, "How much!"

SCAT consists of two systems: one measuring longitudinal acceleration and the other, the Speed-Control-Lift System, which measures angle of attack.

The speed-control group consists of:

1. The Lift Transducer (wing unit), a simple fore-and-aft spring-centered vane, strategically located with reference to the stagnation point on the leading edge of the wing. It senses any deviation from the desired angle of attack.
2. The Flap-Position Transmitter, a potentiometer which modifies angle-of-attack information relative to the degree of flaps used.
3. The Signal-Summing Unit (*Continued on page* 64)

Concealed dangers often lurk in materials and chemicals used around aircraft. Here's a pilot's rundown of

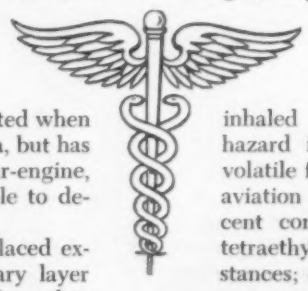
TOXIC HAZARDS in AVIATION

By JOHN T. FLYNN, M.D.

MATERIALS and chemicals important to the construction, maintenance, and operation of aircraft often conceal a possible hazard to the pilot himself. The effect upon the human body depends greatly upon the quantity of the toxic material, upon the length of time of exposure to it, upon the ability of intense heat to produce even more dangerous materials from it, and on the measures promptly taken to combat the hazard as soon as it occurs.

The smaller and more airtight the aircraft cabin or compartment, the greater is the danger.

Exhaust gases containing carbon monoxide are more hazardous in single-engine and trimotor aircraft, where a reciprocating engine is directly ahead of the cabin or cockpit. Carbon-monoxide contamination of helicopter cockpits has been frequently suspected when the pilot complains of headache and nausea, but has been difficult to prove. Twin-engine, four-engine, and jet-propelled aircraft are far less liable to develop such a contamination.



Even in aircraft with supposedly well-placed exhaust vents, exhaust gases in the boundary layer next to the aircraft skin have entered the cabin through creeping canopies, imperfect baggage compartment seals, or tail wheel openings; faulty cabin heaters also have been responsible.

A pilot who experiences headache, drowsiness, increasing mental difficulty and physical in-co-ordination without obvious cause, should suspect possible carbon monoxide over-exposure; adequate cabin ventilation and prompt use of oxygen, if available, will help combat the danger.

Heat damage to the varnishes, plastics, rubber, and fabrics in electrical equipment cause 50 per cent of the fumes and smoke in cabins; headache, eye and nose irritation, and distressing odors are usually the most severe effects. However, in small enclosed cabins, highly toxic fumes containing carbon monoxide and fluorine compounds may be formed, with serious lung irritation and asphyxiation.

Fire extinguishers should not involve the use of carbon tetrachloride, chlorobromethane, or methyl bromide. The first named substance, accidentally leaking from its container in a closed aircraft cabin, can produce drowsiness, headache, excitement, and coma; in contact with hot metal, it changes to phosgene, a highly irritating poisonous gas used in World War I. Carbon tetrachloride fumes, in small enclosed spaces, are dangerous to liver and kidneys, and can be fatal.

The other two compounds, chlorobromethane and methyl bromide, can be highly irritating to the eyes and skin, especially when subjected to high temperature. The use of compressed carbon dioxide as a fire extinguisher is reasonably safe, provided that the rapidly expanding gas escaping from the cylinder does not come in direct contact with the skin, where its very low temperature may produce severe burn.

Carbon dioxide concentration of five to six per cent in the cabin air usually can be easily tolerated, producing only a need to take deeper breaths; eight to 10 per cent concentration, over a 10- to 15-minute period will produce mental symptoms and drowsiness in some people. Ventilate the cabin as soon as possible after control of fire or in case of a faulty, leaking extinguisher.

Engine oil accidentally escaping into an aircraft cabin, as for example in the bleed air from a turbo-jet engine compressor, may cause mist which interferes with vision if exposed to temperatures above 550 degrees F. The oil may pyrolize to substances which cause eye irritation, profuse tears, nausea, nasal irritation, headache, and objectionable odors.

The mist of hydraulic fluids discharged into an aircraft cabin from a burst line or fracture of a pressure-gauge tubing may cloud the vision or cause mild skin irritation, but generally is not toxic unless changed by fire or other high temperature causes.

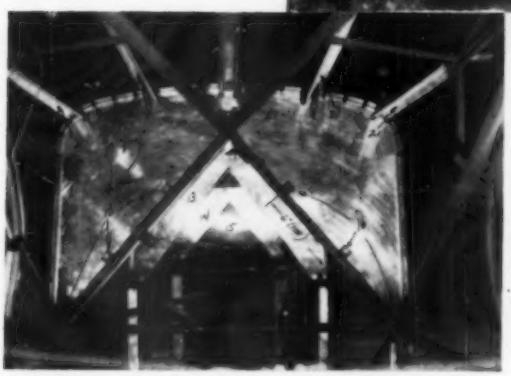
The fumes of aviation gasoline can be irritating and nauseating and in high concentration produce mental symptoms; if inhaled for long periods in a closed space, the hazard is somewhat greater from breathing the volatile fumes of tetraethyl lead, usually present in aviation gasoline in about two-tenths of one per cent concentration. Generally, the danger from tetraethyl lead is small under ordinary circumstances; exposure to pure tetraethyl lead would be uncommon for the average pilot, but it should be avoided even on brief skin contact.

Anti-icing and de-icing fluids, such as ethylene and propylene glycol, can produce kidney damage and irritate the lungs, in cases of accidental heavy exposure.

The inhalation of oxygen almost never causes difficulty; the odor of trichlorethylene, used to clean the oxygen cylinder may, at times, annoy or frighten the user. After a period of oxygen lack, sudden breathing of oxygen may, with some individuals, cause momentary confusion and black-out, but (*Continued on page* 102)

Left: Weighing but 40 pounds more than a standard Super Cub, aircraft received first STC (supplementary type certificate) in Alaska. Skin is .020 24ST in most areas and .025 aluminum in five, with removable bottom panels for inspection ease. Job might cost $1,000 in Alaska.

Right: Tail section cutouts for inspection holes, stabilizer. Below: Marked photo of bulkhead, stringer attachment typifies pictures submitted for FAA approval. Drawings, key sketches, step-by-step instructions, parts list also were required, accepted.



Bad landing areas, bitter cold, led an Alaskan bush pilot to a clever answer to fabric-covering damage.

You can metalize your aircraft

By CHARLES GRAY

FOR SEVERAL years, a mechanic friend of mine, Dave Phillips, and I discussed the feasibility of metalizing the fuselage of my Piper Super Cub. I had been operating the aircraft in Alaska and my work often called for landing on rough gravel strips and unprepared areas with consequent tears and damage to the fabric covering. Winter operations, often in temperatures of 40 degrees below zero, made the fabric as brittle as thin glass, easily shattered at the lightest touch. To get full utility out of my airplane it became obvious to me that it needed a tougher skin, one that was not subject to ring worms, damage and deterioration.

Looking for a solution, I found that metal conversion kits for the Super Cub were not available and inquiries about some of the new fabrics, dopes and finishes currently being tried, only confirmed my belief that there is no substitute for aluminum. The only answer to the problem seemed to be for Dave and me to tackle the conversion. My first step was to contact the local FAA general safety agent, Albert Mueller, and inform him of what we had in mind.

Mueller told me that the FAA had just appointed an aeronautical engineer to the Fifth Region (Alaska) who worked out of the Anchorage office. I was to submit to him sketches of all important points in the proposed project. My brother Bill, a civil engineer, was called in and, although he had no aeronautical experience, he was able to make some very creditable drawings under Dave's supervision.

The sketches showed the method Dave intended to use in fastening the skin to the tubing, attachment of vertical fin skin to the fuselage skin as well as the means of handling the skin around window channels.

The drawings were completed in a couple of evenings and mailed to the FAA engineer at Anchorage, along with a letter explaining what (*Continued on page* 88)

NEWSREEL

LOS ANGELES AIRWAYS recently took delivery of a turbine-powered Sikorsky S-62 10-passenger helicopter, as first step toward converting to an all-turbine fleet. Presently operating seven piston-engine helicopters which serve 20 cities and communities in the Los Angeles area, the airline has on order five twin-turbine, 28-passenger S-61s for 1961.

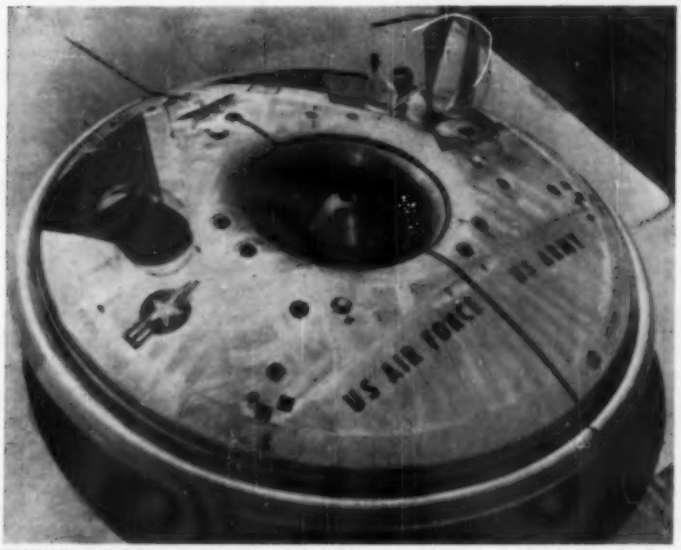
BELL 204B is a commercial version of the military HU-1B Iroquois turbine helicopter which holds a number of world rotary-wing records. Accommodating 10 passengers and capable of 147-mph maximum speed, it was first introduced during the National Business Aircraft Association's meeting in Los Angeles, Calif. Power is supplied by a Lycoming T53L9 turbine engine rated at 1,150 eshp.

PIPER UO-1 is a utility transport, a number of which have been ordered by the U.S. Navy. The aircraft is a military version of the popular Aztec business plane. Similar in most respects to its civilian counterpart, it varies in radio, oxygen and propeller anti-icing equipment. Range is more than 1,000 miles. The cruising speed is 200 mph.

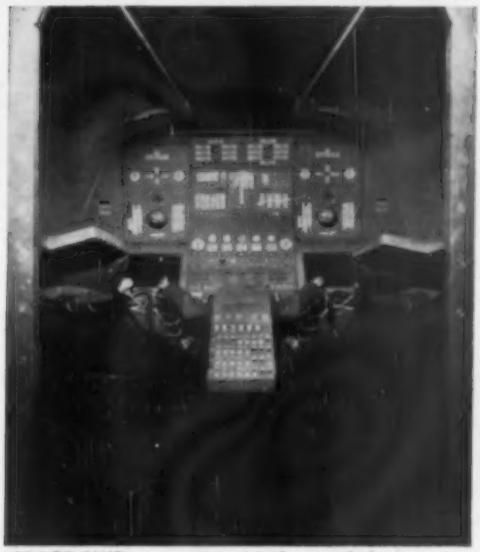
BEECHCRAFT TRAVEL AIR is powered by French Turbomeca Astazou turboprop engines rated at 470 eshp each. Installation, made in France by SFERMA, a subsidiary of Sud Aviation, boosted top speed to 330 mph. Despite considerable increase in power no significant beef-up was needed. Gross weight of the aircraft is 5,000 pounds.

NEWSREEL

MONTECOPTER. Cold-cycle, pressure-jet helicopter developed by Monte-Copters, Inc., Seattle, Wash., powered by a Continental 141 turbo-compressor engine. Compressed air is ducted through the interior of blades and ejected from the tips at high speed. Fiberglass hull-like fuselage and tanks at tips of the delta wings give helicopter amphibious capabilities.



FLYING SAUCER. Designed and built by Avro Aircraft, Ltd. of Canada for the U.S. Army and the Air Force, the disc-shaped research VTOL craft can take off and land vertically in ground effect, and fly like a conventional aircraft on the lift of its circular wing. Three Continental J69 turbines supply the power.



SPACE SHIP crew station. Mock-up study by Lear, Inc. for Flight Control Laboratory of the Air Force shows display instrumentation and grip-controls (on seats) for a hypothetical space bomber for 300-mile-high orbit.

RUSSIAN HELICOPTER. Four-place rotorcraft with all-weather capabilities, designed by Mikhail Mil and based on the popular Soviet MI-1. It was specially designed for agricultural, industrial and short-haul uses. Its name, Moskvitch (Muscovite), is said to have been inspired by Nikita Khrushchev.

NO. 246

I learned about flying from that!

Takeoffs are routine—or so they say. After running out of runway thrice he decided to remember rules beforehand.

By GIL PAUST

AN UNSETTLING experience, in more ways than one—to go barrelling along on takeoff and suddenly come to the end of the runway—with your wheels still glued to the ground! What can you do? A better question: What didn't you do? To this one I've a lot of answers because I've run out of runway no less than three times.

The first time was in spite of the fact that I was a veteran and knew all there was to know about flying, as proved by the 50 hours in my log and the private ticket the CAA had just given me. It was the a.m. of the first really warm day in April, shortly after the trout season had opened in New York State, and I'd lifted my Super Cruiser from Somers Airport (now, unfortunately, a cornfield) and pointed her spinner toward Livingston Manor Airport, about 90 miles distant in the Catskill Mountains. My passenger was fellow-angler Jim Connors. Our objective: to defy the denizens of the famous Beaverkill River. Or, close to it, its offshoot the Little Beaverkill which babbles right past the airport, making the setup perfect for flying fishermen.

We found the 2,000-foot-plus strip in the river valley flanked by low mountains but with clear approaches north and south. The wind sock was limp, and since this was BU (before Unicom), all landing decisions were up to me. I came in toward the north. At the far end of the sod runway was a cornfield (no relation to the corn that's now growing at Somers) with stubble still standing, and beyond this was a stretch of grass, then the town of Livingston Manor.

It was a perfect three-point squat, gentle like settling on eiderdown, maybe mostly because I'd set her down in a sea of soft muck! It seemed the river had recently receded from a spring overflow, leaving the south end of the strip a bog, although the sod still covered it and it looked like terra firma from pattern altitude. Okay, so I should have been suspicious and dragged it first! But the landing was safe enough. That wasn't what got me into trouble.

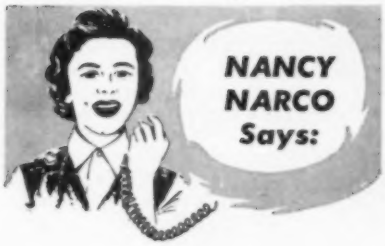
After we'd finished fishing that afternoon (eight nice rainbow trout) we scrubbed the dried mud from critical spots on the Cruiser and I cranked her up. A slight zephyr from the north was coming in, so I had to take off in the same direction I'd landed. But I wasn't going back into that mud! Too much work to clean it off! I stopped just short of it and after the usual check, I let 'er roll. The remaining length of the runway before me was almost as long as the one I'd gotten used to, and never used all of, at Somers.

Three-quarters of the way down, at takeoff speed (it seemed), I tried to pull the Cruiser off. She hiccupped a yard into the air and plopped back. I did it again; so did the Cruiser. What was wrong? The engine had revved up sufficiently on the check. A glance showed me the carburetor heat was "off," the mixture "rich." Ahead of me the corn stubble looked as formidable as an array of antitank pickets. Should I groundloop my investment or take a chance? The decision had to be an instinctive one. What would yours have been with only 50 hours behind you?

At the last second I hauled back and we vaulted into the air. The dried cornstalks sounded like buzz-saws against the landing gear. We staggered through them, then with will power that amazed me I held the nose down to pick up speed and kept her on a straight level course straight for Livingston Manor. As a result we entered town at an altitude that would have curled the hair of an Alaskan bush pilot—but at a safe airspeed. We turned right down Main St., then left over the bridge. Connors told me later he could see the trout scatter. We must have scared them as far as Roscoe. And I'll bet that wasn't all we scared! On our return over the airport at more conventional altitude we saw a swath had been cut through the cornfield. By us?

With time to think, I realized the mistakes I'd made. Overloading wasn't one of them! I weighed 120. Connors was over 200 but even if we count him as one-and-a-half passengers in the three-place Cruiser, we were well under the limit because our tanks were only half full and as baggage all we had were a couple of fishing rods, a couple of small tackle kits and about six pounds of trout. The effect of altitude on performance was the little item I'd forgotten!

Somers was about 400 feet; Livingston Manor was 1,440. At the latter I'd need a longer takeoff run because the air was less dense. Then I'd compounded the mistake by letting the mud (*Continued on page* 58)



MIKE FRIGHT

Perhaps we'd better chalk up this one as a little pep talk for the benefit of the not inconsiderable number of people who have such a case of mike fright that they're afraid to use the radio in their airplanes.

Worry #1 seems to be the misconception that all inhabitants of control towers are large, hairy gorilla types, with horns on their heads, claws instead of fingernails and built-in disdain for anyone short of an airline captain.

Such a concept couldn't be more contrary to the truth. Just visit a tower and you'll see for yourself. Visits by students and private pilots are encouraged, incidentally, for just this reason *(if things aren't too hectic)*. When you get to the tower, note carefully the absence of horns and claws on any of the controllers. Note that they're really human beings. Then remember that the only reason they're getting paid is to help insure *your* safety. Many of them are pilots themselves; all know and understand your problems. You'll find FAA controllers, as a group, the most patient people in the world.

Worry #2 seems to be fear that you won't understand what the tower says. Admittedly, the first few times you listen to a tower the words don't seem to make much sense, but you soon become accustomed to the phraseology. In the meantime, if they're rattling off instructions too fast, just ask the man to give it to you a little slower. Unless you're at a very busy airport where they haven't much time to spare (and where you shouldn't be until you have more experience) they'll go out of their way to talk slowly if they sense that you're a "new boy."

Worry #3 seems to be a fear of not using the correct phraseology. Clear, concise radio transmissions are recommended to avoid unnecessary clutter, but such parlance is *not mandatory*. As you use radio more, you'll naturally develop the lingo because it's the logical way to say certain things quickly. But don't be afraid to talk. Just think of your radio as a telephone, which you probably use with the greatest of ease and nonchalance.

Your radio's your best friend in the air. Don't be afraid to use it.

Regards,

Nancy

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Hiller's New E4

(Continued from page 34)

collective pitch while adding to the E4's overall stability.

In cruise, and in all other flight attitudes, stability about both the longitudinal and lateral axes was quite good. This cuts down the number of constant small control adjustments typical to most rotor-craft.

The E-4 used for the evaluation had been outfitted with soundproofing to reduce the noise level in the bubble. Conversation could be carried on without intercom at a tone slightly above that used for ordinary speech. (Engine noise can be reduced even further through an additional soundproofing kit, available as an extra, which includes an engine muffler system.)

Passenger and pilot comfort at 80 mph, based on the low noise level and the vibration-free ride afforded by expert rigging, was quite satisfactory.

In cruise, several violent movements were made with the cyclic to simulate unusual conditions which may be imposed by external forces and to determine the aircraft's reaction. The E4 offered more than enough control system response to overcome these induced attitudes.

Airspeed then was increased to approach the Vne (never exceed, or maximum speed) of 96 mph. Full power was applied and, as the airspeed built up over 93 mph, vibration was felt feeding back through both the cyclic and the collective. However, the degree of vibration other than in the controls was negligible so far as our passengers were concerned.

In the E4, if necessity demands, full power can be pulled indefinitely without fear of engine damage since the engine is rated for its maximum horsepower.

As letdown for the power-on approach was started, collective was reduced to carry 11 inches of mp while maintaining 3,200 rpm. In turning to establish a "straight-away," control response was immediate. Although rudder pedal reaction, in this sense, is typical of small helicopters, a control lag in both the collective and the cyclic can often be anticipated. The E4 requires no such anticipation since, in many respects, it responds like a fixed-wing aircraft.

Once into the wind, an airspeed of 50 mph indicated was maintained with a very slight nose-down attitude. Going through 100 feet, airspeed was reduced simply by leveling the nose. At 40 to 50 feet the rate of descent was checked with a slight application of power. With airspeed all but dissipated, a gentle touch-down on the skids was made at five mph ground speed.

As the skids first make contact, the collective should not be lowered too rapidly or they will dig in and arrest the aircraft in a rough and jarring manner. Employing this gentle manipulation of the collective, a run-on landing was made at 45 mph on a smooth surface, with no damage to either the skids or their attached spring tubes.

In shooting a landing in which the E4 was brought to a hover prior to touchdown, the lack of vibration in its transition from forward flight is an outstanding and unusual feature in heavily loaded rotorcraft. From hover, sideward, rearward flight and turns about a given spot were made to determine the handling characteristics of the E4 in work close to the ground.

Sideward flight is a routine maneuver with no airspeed limitation set. In the other phases of low work, it was noted that as the tail is brought about into the wind, or when rearward flight is commenced and velocity is increased, the tail has a tendency to come up. This is due to the newly installed rear stabilizer located just forward of the tail rotor on the boom. To overcome the tendency, a considerable amount of back cyclic is required. The electric stick trim offsets the manual pressure application necessary to maintain these downward flight conditions.

In every dimension of flight, the handling ease of the E4 was evident. This same mechanical tightness in the control system that enabled immediate response in normal operation, carries through to the more critical procedures involved in autorotative flight.

HILLER E4

Specifications:

Empty weight	1,775 lbs.
Useful load	975 lbs.
Allowable gross weight	2,750 lbs.
Width (not including rotor)	5.0 ft.
Overall length	27.7 ft.
Height of cabin	6.1 ft.
Height to top of rotor head	10.1 ft.
Interior cabin dimensions:	
Overall width	4.9 ft.
Three-place seat width	4.7 ft.
Cabin length	6.8 ft.
Cabin height	4.4 ft.
Main rotor diameter	35.4 ft.
Tail rotor diameter	5.5 ft.
Number of main rotor blades	2
Number of tail rotor blades	2

Engine:
Lycoming VO-540 rated at 305 hp at 3,200 rpm at sea level.

Performance:	Production E4s W/Dual Carb.	W/Dual Carb. and High-Comp. Pistons
Maximum speed (sea level)	96 mph	96 mph
Cruise speed	90 mph	90 mph
Range (sea level)	225 miles	225 miles
Rate of Climb (max.)	1,340 ft./min.	1,340 ft./min.
Vertical rate of climb	820 ft./min.	820 ft./min.
Service Ceiling	14,600 ft.	16,500 ft.
Hover ceiling (in ground effect)	10,000 ft.	11,400 ft.
Hover ceiling (out of ground effect)	6,400 ft.	7,300 ft.

Simulating an emergency involving engine failure, the throttle was retarded to disconnect the engine from the rotor system. (The E4 has a rotor range of between 314 and 395 rpm.) Entry into autorotation from cruise was initiated at 700 feet downwind, approximately one-quarter of a mile from the field.

The E4 was promptly wrapped in a 180-degree turn to get into the wind and aligned with the landing area. The nose was kept quite low in the turn to maintain airspeed but was eased up in the straight-away to hold between 55 and 60 mph. Rotor rpm was kept at 365 which offered a large enough margin of safety to ease the aircraft comfortably to the ground.

Although the rate of descent is between 1,800 and 2,000 feet per minute, the landing technique is just about the same as that employed in powered flight. Airspeed and attitude are dissipated almost simultaneously but the nose is lowered very slightly prior to touchdown to insure some measure of forward speed.

The key to flying the E4 lies in taking advantage of its large degree of control response without over-controlling. Coupling this knowledge with the characteristics of the aircraft will afford both passenger and pilot a maximum of helicopter pleasure.

Hiller's list of standard equipment for the E4 includes edge-lighted instrument panel, all-metal rotor blades, an improved collective friction control, a nickel-cadmium battery, sliding windows and ground handling wheels.

Customized interiors, such as in the plush E4 demonstrator, are created for Hiller by Bay Aviation Services (Oakland, Calif.) as an extra. Included are special upholstery, carpeting, and soundproofing which serves the multi-purpose of adding to eye appeal and comfort while cutting the noise level.

In the way of radio equipment, Hiller is prepared to offer the new King KY-90 VHF as a special accessory. Its high, 10-watt output, light weight, and small space requirement make it the neatest installation for the E4's panel design.

A full inventory of accessories for the E4 is still in the planning stage. Initially, however, Hiller already has a short list of pertinent extras. There are: easily connected dual controls that are ideal for training; navigation and landing lights; and a cabin heater and defroster. Additional accessories presently certificated for the 12E will be made available for the newer model by the first of the year.

In taking a quick look at some engineering details of the E4 it is interesting to note that Hiller uses interchangeable rotor blades. This is an important cost consideration since, in two-bladed rotorcraft, a complete new unit must usually be purchased even if only one blade is damaged.

Blades can be tracked in flight by the use of colored reflectors at the blade ends. Any discrepancy can be readily corrected on the ground by an adjustment of the hinged trim tab on the blade itself. Hiller is currently working on a new, heavier blade for the E4. The diameter will remain the same but it will have a larger chord. The object will be to decrease the rate of descent in autorotative flight under maximum gross conditions and add to the performance at altitude.

The E4's Lycoming engine currently has an engine life of 750 hours. This is expected to be improved to 1,000 hours within a year. Engine overhaul work is done directly through Lycoming.

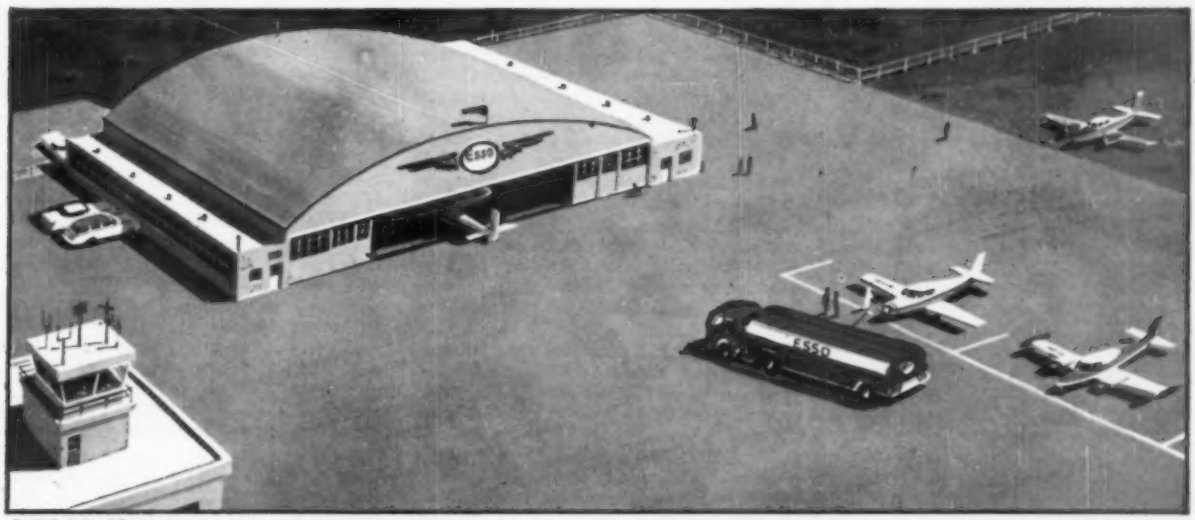
At the present time, according to Bud Chaney, senior requirements engineer for Hiller, many helicopter operators prefer the piston engine to turbine power. This is due, in large part, to the more widespread availability of service and parts currently open to the piston user.

Turbine development is an important item on Hiller's agenda. They are watching with considerable interest the increasing competition in the small-turbine field. Although the company is definitely planning to enter the turbine power field in what it calls the "prestige market," the earliest date contemplated is still two years away. Up to that time, and perhaps beyond it, the E4 with the high standard of performance evidenced in this evaluation, has a vast potential to offer to the growing helicopter industry. END

WING TIPS

WATCH THE BIRDIE. Whenever your plane is "staked out," even for a day or two, check your engine before take-off. Birds have a tendency to build nests in sheltered spots. An unnoticed nest near an engine in flight can lead to overheating or a mighty serious fire hazard.

DON'T BE AN EAGER AVIATOR. Don't rush to get "upstairs" with the sudden clearing of bad weather. Avoid taking foolish chances. Too many pilots have found themselves in an IFR situation with little or no instrument experience.



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ACF Pictorial Display

(Continued from page 39)

New Brunswick intersection.

Obtaining a new heading is a simple matter when flying the display. A knob in the lower left-hand corner of the unit swivels a grid which lies across the face of the map. By aligning the grid with the reticle, and any desired point within the VORTAC area, the new heading can be read at the end of a pointer line, which extends across the center of the chart, to azimuth information given at the chart border.

The pointer line also is broken down into inches and fractions to allow mileage information to be ascertained at a glance. When the reticle showed us to be over the intersection, the omnis were cross-referenced, placing us exactly where the unit indicated our position to be.

As darkness increased the instrument lights were turned up along with the red "blacklighting" for the display. (White "blacklighting" is also available to the purchaser.) A rheostat knob at the lower right-hand corner of the unit controls the desired brightness. When employed in conjunction with the larger scale maps the small printed matter on the mylar becomes almost illegible.

This need for chart clarity has been the cause of constant research by both ACF and Jeppeson to have the amount of material on the transparencies reduced to only the size necessary for display. As these nonessentials are continually weeded out, enlargements of the remaining details will follow.

After preliminary accuracy check, our course was altered to resume the original track to gain station passage at Solberg. The reticle indicated our position over the station by undulating around the chart center in a tight circle. The omnis were used to determine accuracy and again verified the reticle's path on the display. With headings maintained the reticle oriented itself and began tracking outbound.

At this juncture in the flight an off-airways time-distance check was accomplished to enable an estimate of our arrival time at Atlantic City. With the display ground speed is figured, simply, by timing the reticle over a known distance on the chart.

As we began to lose the Solberg signal the reticle wavered first in azimuth then in distance and the checked warning device reappeared, notifying us of the error.

The Atlantic City VORTAC was tuned in and the Atlantic City 10-mile-per-inch chart inserted. As we tracked inbound, thunderstorm activity over the field made it necessary to alter course for the Robbinsville omni where we had to simulate the terminal phase of the evaluation.

After receiving station passage at Robbinsville an off-airways holding pattern was set up by flying the reticle around a holding pattern track imposed on the transparancy and cross checking the altimeter for altitude accuracy.

While flying with the display under IFR conditions it is best to set up a normal instrument scan to avoid becoming fascinated with the path of the reticle across the chart. Used in co-ordination with the basic instruments, the display represents a remarkable aid in the transition from visual to instrument flight through orientation with ground positions.

Returning to Teterboro, the accuracy of the ACF display enabled us to fly the edge of a restricted area en route to the field. The ability to take this direct path saved us the trouble of constantly cross-checking our position, or the time that would have been involved in taking a round-about route home to circumnavigate the increasing thunderstorm activity.

The display, as flown, is presently available directly through the Paramus, N. J., facilities. After a distribution structure is established ACF will handle direct sales only to the commercial carriers and to larger executive fleets. Plans then call for dealers allied with ACF to carry a line of the displays to meet the demands of general aviation.

Sales to date have been to the FAA but, once certificated as a primary navigation aid, ACF expects to find markets throughout the industry from the small, privately operated aircraft up through the largest and fastest commercial models. Pan American has taken a display unit on consignment aboard a globe-circling Boeing 707.

While the unit's size makes it relatively easy to place in the cockpit, ACF is willing to modify it to fit any configuration. Aside from their own Aero Commander the display has been set up in a DC-7 and a Grumman Gulfstream by the FAA.

Although the VORTAC charts for the display are still more or less in the experimental stage, at this writing they are available in scales of 10, 20, and 48 nautical miles to the inch.

An aircraft would require approximately 800 slide maps to "cover" the United States. Jeppeson estimates that with the current FAA rate of nine revisions per year an annual service charge to update the charts would run $300. This, of course, will be prorated proportionally if charts for only one area or section of the country are being used by the operator.

Servicing is estimated at 1,000 hours. To gage the accuracy at any time, however, there is available a special piece of test equipment. It is a small black box that ACF has priced at $95. In the cockpit or in the shop, the azimuth and distance features of the display, can be gone over individually to enable a fast check to see where the trouble lies.

In the development stage ACF has mockups of an RT-1C "see through" device. This will be aimed at the general aviation market as a low-cost navigation aid. Priced at about $1,800, the 1-C will not be self-contained but will offer the same type of visual orientation as the more expensive models.

An official at FAA's National Aviation Facilities Experimental Center said that ACF's device was one of several navigation aids under evaluation since September, 1959. Aim is to develop procedures making for ease of use by purchasers, following certification.

Performance of the equipment during FLYING's evaluation definitely points up the benefits to be derived from a pictorial system, not only as an invaluable pilot aid but perhaps as a final solution to today's airspace problems. END

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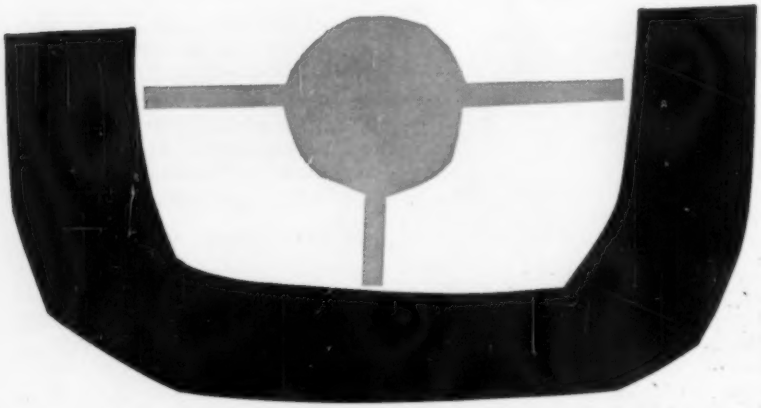

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I Learned About Flying

(Continued from page 52)

dissuade me from using all the runway. Also, the heat of the day meant the air was lighter with less lift than I'd been accustomed to during the winter. And to top it off, I had nothing but a little zephyr to help me upstairs. The only person happy about this narrow escape was Mrs. Connors—and by the next day Jim went on a strict diet.

My second close call came when I was sadder and wiser by at least another 50 hours. I was vacationing at Hague, near the upper end of Lake George in New York State, without the Super Cruiser which was getting an engine overhaul. There I chanced to meet a chick I just had to impress and so I trundled her off to the nearest aircraft rental which happened to be a one-plane deal at Ticonderoga Airport (later just another abandoned field). The operator checked my logbook, then turned over his J-3 Cub. Chick and I climbed aboard and very professionally I taxied to the downwind end of the runway and started a check. Right mag—okay! Left mag—*burp! burp! burp!* I taxied back.

"Oh, yeh!" chuckled the operator. "Just finished a job on this kite. Must have got the plug leads mixed up!"

He shifted them around and I taxied out again. But my poise had been shaken. I checked that left mag a dozen times to be sure. Then the right again. Finally I swung around and started off.

Shades of Livingston Manor! What hadn't I done this time! The Cub hopped down the long runway like a bullfrog with me trying to lift it off. I was about to tramp on the brakes when she listened to reason. Or seemed as though she was about to. She climbed to an altitude of six inches and held it for a quarter-mile, the air-speed needle just above the stop. Finally she began to show a rate-of-climb—about one yard a minute! At the end of the runway was the foot of Lake Champlain. When we sailed out across it we must have been breaking a record—the closest a landplane has ever come to water without getting wet!

After a few minutes, with the help of some thermals, I think, we reached 2,000 feet. I relaxed a bit and looked below. Lake George Village! It couldn't be, yet it was! And that meant we'd travelled the entire length of Lake George faster than any 65-hp Cub had ever flown before. I'd thought the airspeed indicator was kaput because it had been showing almost 110 mph at cruise rpm, more than my 100-hp Cruiser. But it hadn't been lying. Cautiously, I turned the hot-rod and headed back. Things were happening that I didn't like.

"Oh, yeh!" chuckled the operator. "When we nosed her over, we broke her prop. That's a Luscombe prop we've put on her!" My reply, and subsequent appraisal of his family, are of course unprintable.

Actually, it was another little point I'd forgotten that would have told me before takeoff that something was wrong. My concern over the mag had made me forget to run up the engine to check its static

(Continued on page 63)

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Ed Wigton

Here's the 10-WATT KING KY-90 Transmitter/Receiver that Ed Wigton likes so well. You also will appreciate the 10-watt power that provides extra "reach" and louder, clearer signal... the simple, front-panel controls... the small size (only 3"x6½"x8") ... the lightness, only 8 pounds... and the reasonable cost, only $795.

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COMMUNICATION SECTION

Transmitter: 10 watt rf output, covers all assigned COMM channels, crystal-controlled. Mike gain and sidetone adjustable. Crisp, clear speech with a long reach.

Receiver: 90 channels, crystal-controlled. Tunes synchronous with transmitter—adjustable squelch and volume. DCS position on frequency selector provides transmission on 126.7 mc, reception on 120.7 mc.

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Receiver: Covers all omni and localizer channels, crystal-controlled. One microvolt sensitivity with all circuits designed especially for navigation accuracy. Low impedance navigation signal to operate the King KI-200 Omni-Localizer Converter-Indicator.

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(Continued from page 58)

rpm. The Luscombe prop was larger, had more pitch, and so on takeoff it slowed the engine and reduced power, but in level flight at normal cruise rpm its bigger bite produced a faster speed. Like a variable pitch prop that has been set wrong for takeoff, but right for cruise. If I'd made the run-up I'd have noticed this failure to reach top rpm while the plane was stationary, which would have been several hundred short of the normal top rpm in flight, and I wouldn't have tried to take off. When trying to climb wide open, I guess I was too busy worrying to notice the low tach. Incidentally, the chick wondered why I never took her for another plane ride!

My third tussle with a takeoff might happen once in a thousand times, but it caught me. I was still wiser, by over 300 hours, and the old boners were far behind me. As a Civil Air Patrol pilot I was giving indoctrination flights in an Air Force Cub to CAP Cadets at Armonk Airport. My umpteenth passenger was a youngster who probably grew up to be a blocking back for the football Giants, or a pro wrestler. When he climbed into the back seat of the tandem Cub he was only 15 and a mere 130 pounds. He looked scared, but they all did. Takeoffs were toward the south over a stand of tall trees.

Down the sod we sailed, my left hand holding the throttle wide open. No hopping this time. Just as we were about to leave the ground the throttle control was jerked against my hand. I stopped it half-way and there it froze. I couldn't move it forward nor backward. Something was sabotaging me and I thought I knew what it was. I stole a glance at the would-be airman. He was stretched out like a case of rigor mortis. Mouth open as wide as I wished the throttle was, eyes bugging, he was clutching the door handle with his right hand. His left—I'd guessed it—had a death-grip on the rear-seat edition of the throttle control.

Brakes? They wouldn't stop us with the engine pulling at half power. Could I swing a backwards haymaker that would pry him loose? There was no time for talk. The trees were getting close. In a moment we'd both be wrapped up in a spar-and-fabric package, probably flaming.

I'd once read a news item about a truck driver who'd jumped from his truck after heading it for a river because its throttle had stuck open and he couldn't stop, and at the time I'd wondered why he hadn't just cut the ignition to kill the power. I thought of this incident in the plane, luckily. We skidded to a stop with brakes locked and a dead stick—just short of a maple that could have wrecked a bulldozer.

Whoever heard of removing a Cub's rear throttle-control, as well as the rear stick, before giving a first ride to a passenger? You're hearing it now because I've done it ever since. Imagine where I'd be now if that kid had waited until we were 50 feet off the ground before he decided to get scared?

Flying is a great game and its greatest lesson, which we all learn eventually, is that it doesn't pay to remember the rules afterward—we have to remember all of them beforehand! END

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How to Bring in the Business

(Continued from page 35)

you may be able to interest the local newspaper in carrying an article and picture. You magnify your communications.

How about promoting more air taxi service? If that's the kind of business you want to bring in, let a few people in town know about it. Watch your newspaper to see what merchant is the most promotion minded. Then approach him with the idea of putting up a flying week-end vacation as a prize for some lucky shopper. He advertises the thrills, the luxury, the excitement of a special charter flight to the holiday land you want to carry more passengers to. The merchant pays the bill to advertise and attracts more customers to his store. You fly the winner free and get wide publicity for your taxi service.

Is there an event coming up in a distant town which has wide appeal for the residents of your city? Maybe it's a traditional football game, a town celebration or an opening night play. Select several firms with salesmen and suggest that the next promotion they put on for these salesmen include as an incentive prize a charter flight to the event. For the cost of a letter or a phone call you may bring in a customer which not only will mean immediate air taxi business but could become a regular customer for executive transportation.

Maybe sightseeing rides is an area you want to build up. Here, the group incentive again can be brought into use. Offer reduced group rates, or perhaps one free ride for each three which are paid for. It can be to scouts, graduating classes, luncheon clubs, newspaper boys, 4-H—or any of the long list of possible groups you will find in the telephone books—that you offer your special group prices. How do you reach them? A phone call, a letter, a personal visit. You may even find someone to be your salesman on a straight commission basis. It could be a young man with time to spare after school. It could be a shut-in who would make phone calls.

Bringing in transient aircraft for gasoline, service and other business benefits is an area where public relations can do the major share of attracting. One of the most effective forces you can have working for you is the recommendations of present customers.

So, make it easy for them to do business with you. Keep up appearances of your airport. Have areas clearly marked for tie-down and for gasoline. Provide ground transportation arrangements; be ready to suggest over-night accommodations.

These proposals have touched only the surface of the hundreds of ways to bring in the business. Some may spark ideas from you. They are intended merely to demonstrate that much can be done to bring in the business without getting into extensive, expensive programs.

For added help, keep in mind the people who are your suppliers – gasoline companies, aircraft manufacturers, parts makers. Often, these companies will gladly co-operate in the preparation of sales promotion material.

Maybe to start with you won't put on promotions with the smoothness and professional manner of a skilled advertising and public relations expert. But the real test of any program is its results. END

SCAT

(Continued from page 47)

integrates electronically the signals of the Lift Transducer with the Flaps-Position Transmitter information.

4. The Speed-Control Indicator (SCAT type) is a null-type meter oriented on a horizontal plane with Slow-Fast indications.

5. Pre-Stall Warning (angle of attack), if required, will normally be a stick shaker, bell, buzzer or a horn.

The Ground-Plane-Accelerometer Group consists of:

1. The Ground-Plane Accelerometer which is a gyro-oriented linear accelerometer detecting positive and negative longitudinal accelerations.

2. The SCAT Adapter Unit integrates the signals of the Signal-Summing Unit with those of the Ground-Plane Accelerometer for presentation on the Speed-Control Indicator.

3. The Test Switch interrogates the system to determine proper operation prior to takeoff.

Operationally, by modifying the signal of the Standard Speed-Control Unit as it comes from the Signal-Summing Unit (angle of attack) with the signal relative to the acceleration of the aircraft, the desired intelligence is acquired for presentation on the SCAT indicator. Signals are combined so that decreasing angle of attack and forward acceleration result in a "fast" indication; conversely, increasing angle of attack and deceleration add, so as to deflect the pointer to "slow." It is as simple as that. Movement of the elevators and / or power control in the appropriate direction place the airplane in the proper attitude and result in a centered needle.

Why is the acceleration portion necessary? Why won't angle of attack alone furnish the desired information?

"Chuck" Baldwin, chief of flight operations for Safe Flight pulled a new one on me to answer this—the phugoid mode of the airplane! This is the resonate period of the airplane when disturbed from a steady flight condition and held at a constant angle of attack. If, for instance, a power reduction takes place while flying steadily at a specific angle of attack and this angle is maintained, the airplane will follow an undulating flight path with the nose going alternately up and down with the airspeed varying as much as 20 to 30 knots. The period of a large jet may be as much as 30 to 35 seconds from peak to peak. Whether this increases, decreases, or remains the same, depends on the airplane.

With the addition of the accelerometer to the circuit the phugoid period is sensed and the presentation stabilized on a specific airspeed and pitch attitude.

A C-50 Twin-Bonanza, N3489B, was used for the flight evaluation. Dual SCAT indicators were installed, one directly in

(Continued on page 68)

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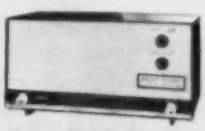

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Antique airplanes at Orange. Foreground, Meyers OTW-1 and Fleet.

SPORT AIR SHOW

Six parachutes descending for precision landing. Streak, top, is smoke bomb.

Dead-stick aerobatics. Howard Cadwell in J-3.

NATIONAL AIR RALLY, the first all-sport aviation show, held over the Labor Day weekend, had all the aspects of a barnstorming air carnival set to modern times. Sponsored by the National Aeronautic Association and supported by sporting aviation's organizations, the Rally featured such events as mass and delayed parachute jumps, spot landing contests, aerobatics, dead-stick landings, antique and experimental aircraft fly-bys, sailplane flight demonstrations, balloon ascension and model airplane flying. Held at Orange Airport, Orange, Mass., the show was a forerunner of similar annual events, designed to show the American public the progress, and contribution to civilian aviation, by organizations engaged in sport aviation. The two-day event was attended by 10,000 spectators, some of whom arrived in 200 lightplanes. Use of Orange airport with its three 5,000-foot runways was made available by Jacques Istel, president of Parachutes, Inc. and originator of sky-diving in this country. The wholehearted co-operation of Orange and Athol, Mass. civic organizations was another factor in the success of the National Air Rally.

Static exhibit of modern aircraft. In foreground is a Schweizer 1-26 sailplane, Piper line in rear. Buildings are headquarters of Parachutes, Inc.

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(Continued from page 64)

front of each pilot, mounted on the cowl above the airspeed where cross-check could be made easily to the flight path ahead or to the instrument panel. The altimeter was 29 96, the temperature 70 degrees and wind north at four knots. A layer of light turbulence lay near the surface but above 2,500 feet it was smooth as silk.

"Chuck" Baldwin and myself were accompanied on the flight by Mr. Lyman Bullard, sales engineer for Safe Flight, and one additional passenger. Fuel tanks were full except for the small amount used tc fly the 35 miles from Westchester County Airport to Zahn's Airport on Long Island.

The initial demonstration was to make a normal takeoff with rotation at V2 minus 10 knots to be followed by a V2 climb. Chuck had briefed me to rotate at approximately 80 knots and to maintain the needle centered on the small V between the "fast and slow" indices. This should result in an indicated climb speed of between 92 and 94 knots.

The aircraft accelerated rather rapidly with the power on 3,400 rpm and 27 inches mp. At precisely 80 knots I came back on the control wheel; the needle centered nicely and the airspeed settled on exactly 95 knots. We were going up at quite a steep angle. As power reductions were made, the needle would immediately move toward the slow side, indicating a need to lower the nose. Keeping the needle centered resulted in a continuous climb of 93 knots.

To demonstrate the phugoid effect the accelerometer unit was turned off (this is a feature of the demonstration airplane only) and a steady climb was established. At an indicated 93 knots the left engine was pulled with the resultant "slow" indication; I lowered the nose, easily centering the needle for a constant angle of attack. With the needle remaining centered the flight path resembled a mild roller coaster with the nose alternately going above and below the horizon. This undulating flight path continued until the accelerometer was returned to the circuit.

We then re-entered a two-engine climb at 93 knots with the needle centered. Again the left engine was pulled, but what a difference! The needle moved toward "slow," but lowering the nose a couple of degrees centered it with the aircraft remaining rock steady at a slightly reduced pitch angle. The accelerometer made all the difference.

From this demonstration we proceeded to a simulated wave-off. With gear down and full flaps the centered needle resulted in an indicated 80 knots. At a simulated altitude of 100 feet, climb power of 24 inches mp and 2,700 rpm was applied. The pitch had to be changed rapidly to keep the needle near center. Some overcontrol was experienced but no further altitude was lost. The gear and flaps were retracted with an immediate "fast" indication (things were happening fast, too) but, by settling down and centering the needle, the airspeed froze to its 93-knot indication. The left engine was retarded, the nose was lowered to retain the needle in its centered position and the Twin-Bonanza climbed

(Continued on page 70)

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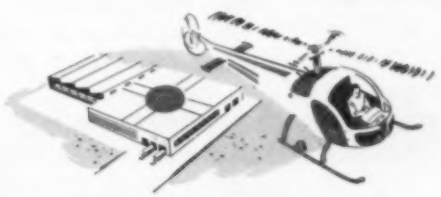

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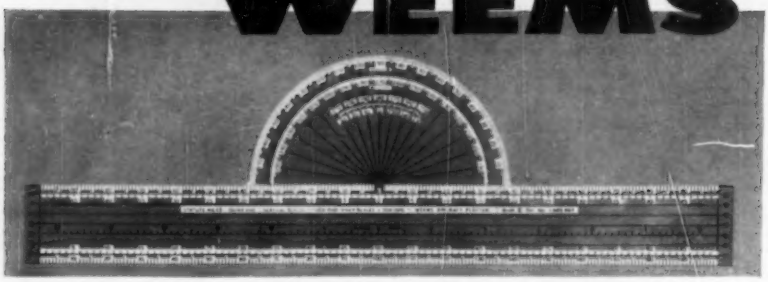

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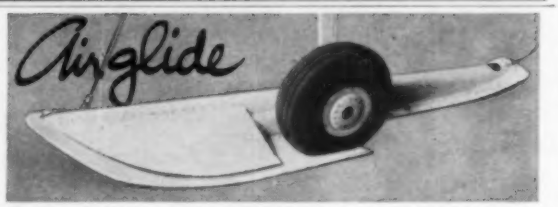

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(Continued from page 68)

away at 93 knots and 100 fpm with no increase in power, steady as if on tracks.

By now we were well impressed by the instrument's ability to produce forecasted results. We proceeded to MacArthur Field, on Long Island, for a VFR landing using SCAT. The indicator was centered on the base leg and the airspeed indicator was covered at this point. It was a cinch to follow a pre-determined visual glide slope simply by controlling the power.

The next takeoff simulated a late rotation at 92 knots. Of course, the takeoff roll was extended and, by the time the needle was centered, the airspeed was over 100 knots. It returned quite quickly and steadied at the 93-knot indication.

As we turned base leg, Chuck suggested I make it difficult by calling my touchdown spot. I called the runway numbers, not expecting to hit within a thousand feet of them as this was to be my second landing in a Twin-Bonanza. With the airspeed covered I flew the SCAT indicator, reducing power when I appeared to go high but always keeping a centered needle. I was most surprised when we covered the numbers on touchdown.

Our last takeoff was over-rotated and too early. At 60 knots with 21 inches mp and maximum rpm I raised the nose quite high. The Beech tried to fly, but couldn't. It skipped along half-on and half-off. I lowered the nose, centered the needle, but it was still tied down. Gradually, it picked up speed and became fully airborne; it was pretty touch-and-go with those power settings.

In retrospect, SCAT lived up fully to every claim made for it. It is a much-needed addition to any instrument panel, particularly for the new high-performance aircraft. Its reception by the aviation industry is, as might be expected, a series of evaluations by various manufacturers and users. Early reports all are favorable.

The Air Force recently has completed its tests using the KC-135. With their maximum gross takeoffs they have a long established requirement for such control. The findings should become available in the near future.

Allegheny Airlines has tests in progress using Canadair 540s; Convair has tests in progress on the 880s, and the maiden flight of this aircraft, equipped with leading-edge slots, will be made with SCAT. Boeing, Douglas, Grumman, and Fairchild all have the basic elements of SCAT as standard equipment on their latest airplanes. Components can be included on a plug-in basis.

The flight in the Twin-Bonanza is indicative of the value of SCAT. The warning it gives against inappropriate takeoff rotation, with the resultant inefficient or even dangerous attitudes, is of immense value. Add to this the safe, effective approach speeds provided by its indications, and the true value of the instrument becomes obvious. On any panel—private, executive, airliner or military—it is a real life-saver.

Right now SCAT is aimed at the airline and military market. Its availability to the business-corporate market will depend largely on the size of military-airline orders received. The price of the equipment is not stabilized yet; and will be dependent on production and size of market. END

Should You Use Detergent Oil?

Ever since the introduction of aviation detergent oil some twelve years ago, questions have come up regarding its use and benefits. The Gulf Oil Corporation, which produces and sells both detergent and non-detergent aviation oil, hopes that the information below will help you decide whether you should use a detergent oil.

WHY USE A DETERGENT OIL? Certain parts of your engine become very hot during operations and this heat causes deposits to form on such parts as valve stems and pistons. These deposit formations become a major factor in determining the time at which your engine will require overhaul.

In addition, they may cause such specific problems as sticking valves, sticking piston rings or burned pistons. A detergent oil that keeps parts clean as it lubricates will obviously give you longer engine life.

CAN DETERGENT OIL CAUSE PROBLEMS? The first detergent oils proved to be highly effective in certain types of engines, but were unsatisfactory in other types of engines. Gulf, after much research and testing, developed an improved formula for unrestricted use in any piston engine aircraft.

This detergent oil, sold under the brand name of Gulfpride Aviation Series D meets—in fact, *exceeds*—the performance specifications for both Continental and Lycoming engines, and is suitable for *all* types of aircraft piston engines under *all* operating conditions.

ARE ALL DETERGENT OILS ALIKE? No. Different brands are made from different base oils and contain different amounts and types of detergents. Furthermore, some brands are multi-viscosity and others are single-viscosity.

Gulf believes that the detergent used in Gulfpride Aviation Series D is superior in keeping engine high-temperature zones, such as valve stems, rocker boxes and piston ring areas, clean. In other words, Gulf's detergent dispersant works best where it's needed most. Gulf and the engine manufacturers recommend *single*-viscosity oils for aircraft engines.

WHEN SHOULD A DETERGENT OIL BE USED? The best time to start using Gulfpride Aviation Series D is when your engine is new or freshly majored. Twelve years experience, however, has proved that you can benefit by using Gulfpride Aviation Series D regardless of time on your engine. Change oil *faithfully* as recommended by the engine manufacturer. This simple procedure will pay off in better engine performance and *more hours between engine overhauls.*

ANY OTHER QUESTIONS? Gulf has additional information available in a Gulf product review on both Gulfpride Aviation Series D and Gulf Aircraft Engine Oil. Write to Aviation Department, Gulf Oil Corporation, Pittsburgh 30, Penna.

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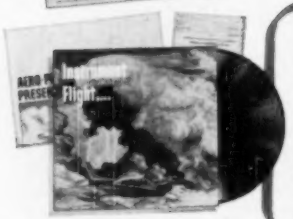

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NAFEC

(Continued from page 25)

trol and communications are becoming too complex and diverse to be dealt with reliably by mere humans. Man's reflexes, his capacity to juggle figures and keep track of diffuse elements, needs the help of up-to-date electronic techniques.

At NAFEC today, work is going on in three areas that should lead to a substantial degree of automation in aviation fairly soon: air traffic control (ATC); communications, and all-weather landing systems.

Data Processing Central: This is the largest and most significant project at NAFEC right now, consuming some 50 per cent of the Center's manpower and about a quarter of its working budget.

In brief, DPC is a semi-automatic air-traffic control system, using high-speed electronic computers, punch-and-print units, visual displays and other advanced devices.

The basic philosophy behind DPC is: Increase the capacity of today's ATC system by introducing these electro-mechanical aids and, at the same time, keep the system flexible enough to adapt to any new developments that may come along in the future.

Traffic congestion often is caused by the fact that ground controllers are so busy handling details, writing flight progress strips by hand, and trying to keep in touch with pilots and other controllers, that they can't quite keep up with their real task—controlling the flow of air traffic. Limitations of the equipment with which they have to work also slow down the flow of aircraft.

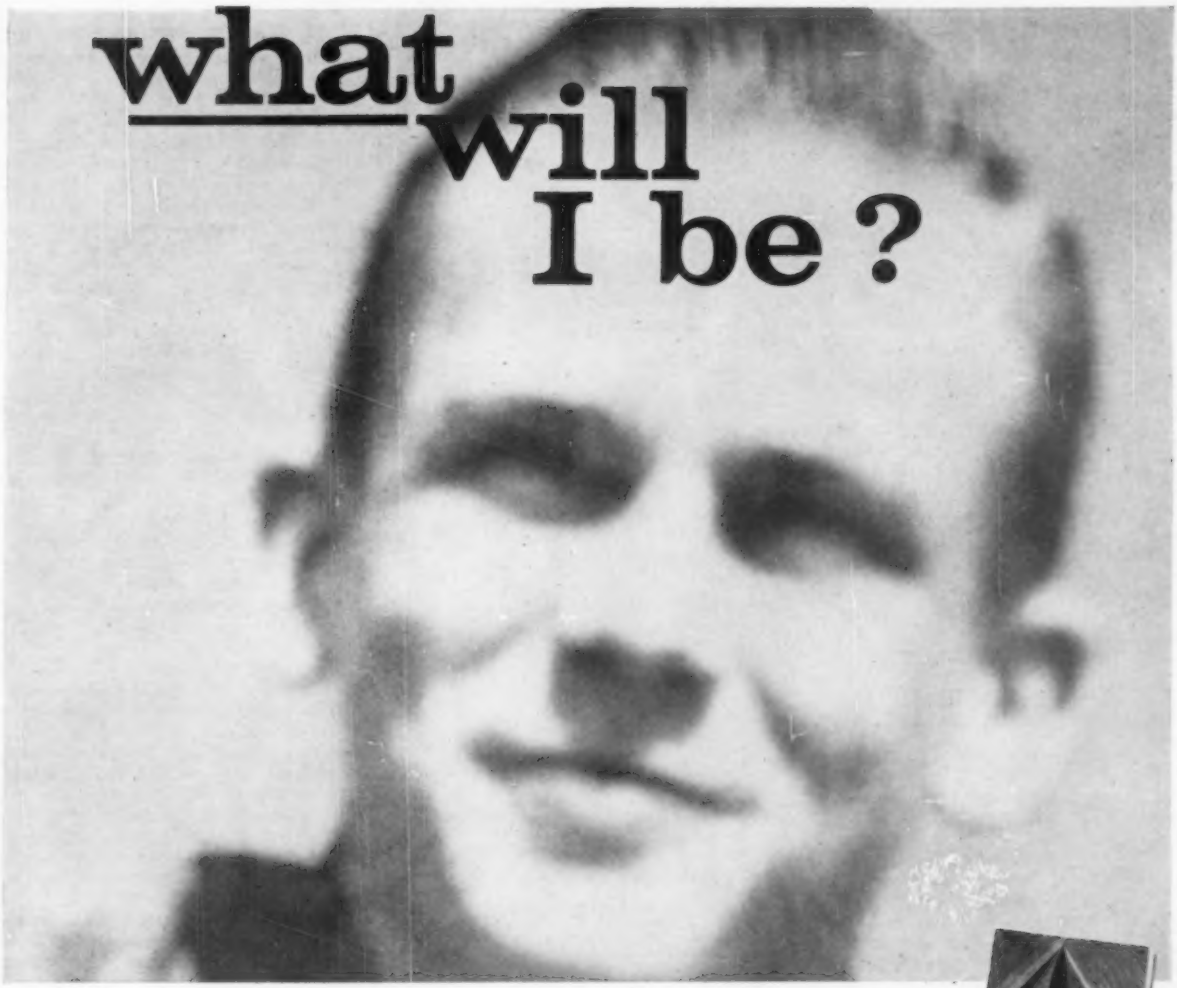
DPC is designed to change all that. With it, controllers will enter any number of flight plans, manually or automatically, into a giant computer. The computer will then process the flight plans; account for checkpoints over which the aircraft are due to fly; provide ETAs over the checkpoints and to terminals; automatically update the flight-progress strips, and alert controllers as much as 30 minutes in advance of any potential collision course.

The entire system was designed by General Precision, Inc., working with FAA technical assistance. The heart of Data Processing Central is a huge, "solid-state" computer that will take care of all the "bookkeeping" that now plagues controllers. It is capable of processing and printing up to 1,600 flight-progress strips per hour, handling 440 complete flight plans per hour, and storing a total of 1,000 flight plans (pending or in progress). It also can sequence 90 arrivals and departures each hour.

Built around the computer, and grouped into Terminal, Transition and En Route sections, are other components of the system. Some of the key units are: *Peripheral (En Route) Sector Console*, containing bays of flight strips which are automatically updated from data provided by the computer, and a keyboard entry device (known as FLIDEN) with which the controller "feeds" the computer with the latest incoming information; the *Flight Data Position Console*, located in the tower of a major terminal, used to exchange arrival

(Continued on page 74)

what will I be?



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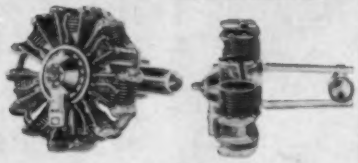

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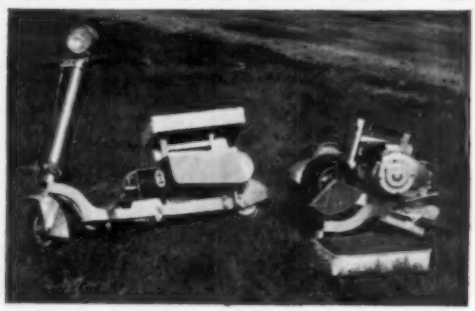

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(Continued from page 72)

and departure information between tower operators and the DPC main computer; *Sequence Console*, a uniquely designed display unit that will provide a graphic picture of the precise sequence of arriving aircraft and any changes in their time-to-touch-down; *Conflict Display*, another picture-tube device, designed to provide, on command, information concerning any possible collision courses being flown.

A full description of Data Processing Central is impossible in this limited space. The important thing to note is that it will bring a startling degree of automation to the ATC system, without requiring radical changes in the system itself. This is because it maintains the flight-strip method, which is the basis of our current ATC system.

DPC will not replace ground controllers in any way. Rather, it will free the controllers for their primary work of making decisions and regulating the orderly flow of traffic. And, because different areas have different requirements—since they experience varying densities of traffic—DPC has been designed for flexibility; units can be added or removed, as local conditions dictate.

The full system, the first of its kind, has been installed at NAFEC, and testing began in September. Evaluation of the system will continue for about 18 months, and the first operational DPC is expected to be phased into the New York area in 1963.

What will this mean to most pilots?

In one sense, it won't mean a thing . . . operationally. That is, pilots will find no essential change in their routing or procedures. It is the ground controllers who will be handling unfamiliar tools.

But in another way, things will be very different indeed. Because of DPC's tremendous capacity and speed, it is anticipated that holding times eventually will be eliminated in the transition area (a radius of 90 miles around an ARTC). In other words, as DPC units are phased in at New York, Chicago, Los Angeles and other key locations, stacking will be reduced, arrivals and departures will be faster and smoother; all of which will add up to substantial savings in both time and money, as well as grey hairs, for private and corporate pilots, as well as the military and airlines.

Automatic Communications: If you've ever flown in a high-density area, trying to reach the ATC center, or the tower, and sweating it out because 10 other guys were on the radio ahead of you, you understand the tremendous need for automatic communications within the air traffic control system.

In an effort to fill this need, NAFEC is currently testing an experimental system devised by RCA, known as AGACS (Automatic Ground-Air-Ground Communications System).

Basically, the system boils down to three main units: *A ground controller's console*, which is a large control console on which the controller can insert routine flight instructions directed at a particular aircraft and, by pushing a button, send the message automatically; *a computer*, which keeps a record of the aircraft under the controller's jurisdiction; and an *airborne display unit*,

(Continued on page 77)

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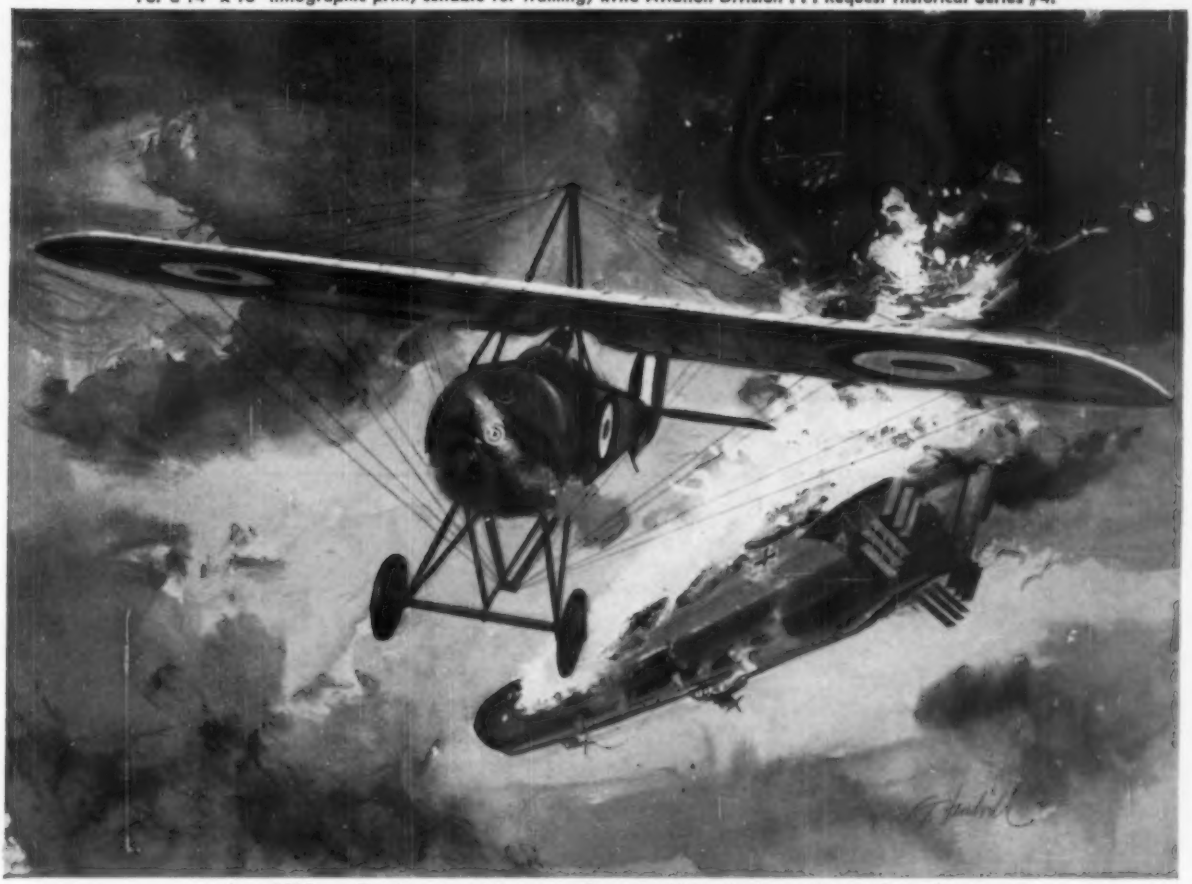

June, 1915 . . . The first air victory over a Zeppelin, Warneford in a Morane Parasol.

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This World War I two-seater was used in combat by the Allies until the end of 1915. Powered with an 80-horsepower rotary engine, it had a top speed of about 75 mph and an initial rate of climb close to 350 feet per minute. Bomb racks, rifle and machine gun mountings were improvised by squadron fitters to suit the occasion. It was while flying a Morane Parasol that British Navy pilot R. A. J. Warneford downed the German Zeppelin LZ.37.

Just after midnight on June 7, 1915, Warneford and two companions took off to bomb some Zeppelin sheds near Brussels. Their Moranes, with the back seats covered, were each armed with a rifle and six 20-pound bombs. After climbing out, Warneford was searching for his two companions when, to his amazement, he came across a German Zeppelin. Although harassed by German machine gunners, he approached and fired his rifle at the airship. This had no effect, but the Germans played it safe. Water ballast was dropped and the Zeppelin shot up out of reach. Undaunted, Warneford followed, slowly gaining altitude. After about an hour, the Zeppelin headed down for a hole in the cloud layer and Warneford found himself above it. He descended in a flat glide . . . releasing his bombs as he passed over it. The 518-foot Zeppelin exploded and fell earthward as 950,000 cubic feet of hydrogen went up in flames.

On the way back, Warneford was forced down in enemy territory by a broken gas line. He repaired this with the end of a cigarette holder, started the engine again, and flew home, landing about 3:30 A. M.

It was an amazing feat of night flying . . . giving the Allies their first air victory over a Zeppelin. Sub-Lieutenant Warneford was awarded the Victoria Cross.

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(Continued from page 74)

which shows the pilot, in letters and numbers, the message sent to him, and through which he can "crank in" his reply and send it back to the controller.

According to Mr. Carlo Yulo, AGACS task manager at NAFEC, "The system is sort of a 'don't-call-us-we'll-call-you' routine, with the controller initiating all normal communcations. Of course, there's a voice over-ride which can be used to send special messages vocally."

Through the AGACS computer, all aircraft entering a particular area automatically become part of a constantly repeated "roll call," which keeps switching from one plane to another in a positive sequence. The system capacity of one AGACS installation is 500 aircraft in a two-minute roll-call. In other words, with AGACS, if there were 500 aircraft in the Chicago area simultaneously, for example, each of them could exchange one message with the ground every two minutes. The fewer the planes in an area, the shorter the time between messages. With only 250 planes hanging around, a pilot could exchange a message with the ground every minute!

The beauty of the AGACS concept is that it will take much of the strain off our already overburdened communications channels. Where about 25 channels are needed today to handle the New York area alone, *just nine AGACS channels could blanket the U. S.*

Gone would be the frantic scrutiny of charts and handbooks to find frequencies, the expense of adding new frequencies constantly to aircraft radios, the endless switching back and forth from one frequency to another.

The AGACS equipment now being tested at NAFEC is just "breadboard" stuff. It won't be operational in its present form. But, out of the current tests will come production-line units that will perform the same functions. According to FAA authorities, such a system should be ready to go early in 1963, which will be just in time to begin operations in conjunction with the Data Processing Central system.

Not long ago, a test flight was run at NAFEC, using a Grumman Gulfstream. During a 45-minute flight, including climbouts, holding patterns and a controlled descent, not a single voice communication was used. All messages were sent via the AGACS equipment.

What about the airborne unit? Will it be heavy, and expensive, and will it pull much current? These are natural questions for small-plane pilots to ask.

The first users of AGACS-type equipment will undoubtedly be the airlines, because of weight and monetary considerations. But work is going ahead on relatively lightweight, "low-cost" units that will fit the needs of general aviation.

According to task manager Yulo, power requirements for the airborne equipment won't be excessive, because it will be all "solid-state" (i.e., transistorized). Total weight only will be between 40 and 50 pounds, allowing about five pounds for the display unit and 35-45 pounds for the data-processing part of the airborne package. Latest figures show the display unit to measure about 6x4x3". The data processing unit will be approximately 6x6x18".

No one, at this date, is willing to give any cost estimate. But that should be forthcoming within the year.

From all of this, it seems certain that automatic communications is just around the proverbial corner. At first, the airlines and military will benefit most. But the very simplicity of it, both for pilot and controller, and the fact that it will eliminate so much "clutter" from the air waves, will make some version of the system imperative for all parts of aviation sooner or later.

Automatic Landing Systems: The need for an all-weather landing system, that automatically will bring an aircraft down safely regardless of ceiling and visibility conditions, has long been considered a "must" for improved air safety and ATC—particularly now that commercial and corporate jets are in the picture.

Many systems have been devised, many suggestions made. NAFEC currently is testing a number of such devices, evaluating them to see which can be made operational most quickly and which will provide the best long-range results.

The program is really a three-part operation. First, an attempt is being made to improve existing ILS equipment to the point where minimums can be drastically reduced. Second, various existing "automatic" landing systems are being evaluated, in the hopes that one of them can be phased into the ATC picture fairly soon, perhaps in conjunction with improved ILS facilities. Finally, the FAA is trying to develop a completely reliable, really automatic system, operational much later.

Improving ILS is a very important part of the program. Every effort is being made to evolve better directional localizers and glide-slope transmitting equipment that will be, above all, *compatible with existing airborne receivers.*

A 173-foot waveguide localizer has been commissioned at NAFEC and now is being used operationally on Runway 13. A larger, 300-foot localizer unit is being installed on runway 4. Tests on both these units will be run during the coming year, in the hopes of achieving a new standard of accuracy within existing ILS procedures.

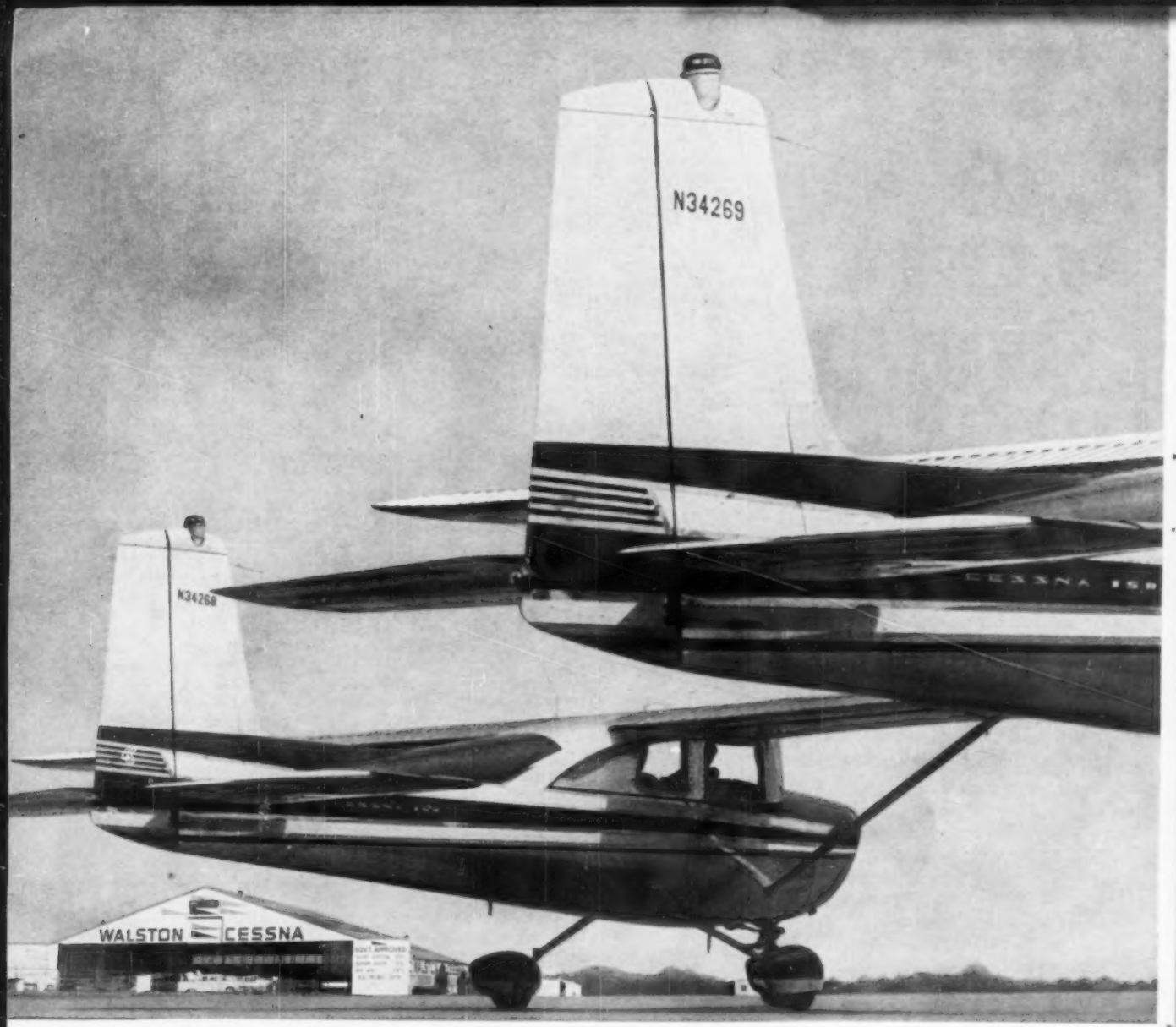
Evaluation already is completed on a new, more accurate directional glide slope, and a report on it should be forthcoming quite soon.

It is hoped that, by 1963, a localizer will be in operation that will provide azimuth guidance all the way down to the runway, and a new directional glide slope will be available that will be good and solid down to 200 feet, or even closer.

On October 16th, NAFEC received a specially-equipped TF-102 jet, with which to test the *North American APN-114* flare-out altimeter system. The flare-out altimeter is a precision instrument designed to give extremely accurate elevation information. It is thought that such a system, used in conjunction with a very fine ILS directional localizer, could provide an interim solution to the all-weather landing problem.

Another system being considered is the British *BLEU* (Blind Landing Experimental Unit). With BLEU, special cables are imbedded alongside the runway, to a

(Continued on page 79)



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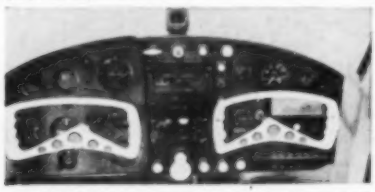

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CESSNA

(Continued from page 77)

distance of about 5,000 feet out from the fence. These "leader cables" provide signals to a special flare-out altimeter and azimuth display in an incoming aircraft. The pilot follows these indications to bring the plane down to a landing, regardless of visibility.

The British have been evaluating the BLEU system for years and claim it is highly satisfactory. A pilot model is soon to be installed at London airport. Tests on the system at NAFEC will continue until June of next year.

The *Bell GSN-5* (developed by Bell Aerosystems Co., Buffalo, N. Y.) is a radar-based landing system which requires that an aircraft have an extremely fine auto-coupler, a special function box, and a small, aluminum corner-reflector mounted on the outside of the plane (to strengthen the radar signal). On the ground, a radar scanner and a computer track the aircraft and constantly compare its descent path with the "optimal" descent path for that type of plane. (The "optimal" path previously has been fed into the computer.) Any deviations from the optimal path then are corrected by automatic radio transmissions to the plane's auto-coupler.

This is a joint FAA-USAF project. Many tests already have been run on it. Of all the available systems, it is probably the nearest to being operational today. But considerably more testing at NAFEC will have to be done before any official sanction is given to it.

In the long-rang field, the FAA is examining a strictly experimental unit known as *REGAL* (Range, Elevation Guidance, Approach, Landing). Designed by Gilfillan Bros., Inc., of Los Angeles, REGAL operates on the principle of air-derived position data. That is, unlike the other systems, it doesn't lock on any particular aircraft. It creates a constant "path" through the air (like ILS), to which any incoming aircraft can lock on and be brought down, manually or automatically. If the system is hooked into a plane's auto-coupler, the landing can be totally automatic.

REGAL is a long way from being operational. Best estimates are four or five years Current NAFEC tests employ an Aero Commander and a C-54, with a T-33 and C-131 to be used later.

There are many problems to be overcome in developing automatic landing systems—simple, direct pilot displays; a minimum of costly equipment to be installed in user-aircraft; an exceedingly difficult psychological block, represented by the natural reluctance of any pilot to just fold his arms and let a "black box" bring him all the way down to a landing.

The attempts to improve ILS, and later to combine it with some partial automatic device, will provide the earliest breakthrough in this area. As NAFEC continues to run its extensive tests, however, automatic landings in the full sense of the word should be a reality for all-weather operations by 1970. END

(In the second installment of this article, we will examine those NAFEC projects not involving automation—such things as new airport lights, visual glide-slope indicators, low-cost DME, etc.)

Pacific Airmotive

(Continued from page 23)

was merging appropriate sales activity under Littrell and the aircraft division. Thus, Littrell sells the new airplanes, also the modification, conversion and overhaul work to be done at Burbank and at PacAero in Santa Monica.

In aircraft sales, PAC is one of three distributors for the Gulfstream, and has sold the major share of the Grumman turboprop executive transports.

There have been no recent sales of new Learstars, of which 41 were built, including 15 of the Mark II version (exterior configuration, powerplant only, no interior, cockpit refurbishing or electronic equipment changes).

Although there are no plans now to take on any new aircraft lines, PAC is keeping an eye on new models, such as pure jets, which would not be competitive in capability with aircraft PAC now handles, as future possible sales items.

PacAero, with its engineering staff and facilities, is better equipped to undertake very large jobs like the Convair, which require extensive engineering effort as well as manufacturing. In the past, Burbank had its interiors work done by Aero Interiors, and its electronics installations done by Qualitron, while PacAero does these jobs itself. According to customer desires, PAC can subcontract to Aero Interiors and Qualitron, or it can pass this work to PacAero.

Burbank can and does service many small airplanes, Cessnas, Pipers and Beechcrafts, while a Twin-Beech is the smallest PacAero works with. Burbank handles many small ramp services and maintenance jobs which PacAero does not.

The wide corporate capability gives PAC an advantage in its new aircraft sales profits—interior design and installation, plus electronics, can amount to from $160,000 to $300,000 on a new Gulfstream alone, which PAC can keep in its own house.

PacAero, which developed the Learstar while part of Lear, Inc., has kept its jigs and tooling for these planes, and maintains a large store of spare parts, sales of which have accounted for a healthy part of PacAero income.

At the present, PacAero is concentrating its efforts to the Super Convair conversion. This involves a new set of horizontal and vertical tail surfaces, plus rework of additional parts of the plane to modernize it and bring it up to the standards of Super Convair. Design of the Allison power package, done by PacAero, is such that the Convair nacelle configuration remains the same from the firewall aft except for the overwing portion where the turbine exhaust runs. The quick-engine-change (QEC) packages are designed for interchangeability and a short down-time to make an engine change, the same principle used in Lockheed's Electra power package.

PacAero fabricates the new Super Convair tail surfaces itself while the nacelle structure is subcontracted. PacAero does, however, assemble the engines and accessories into the nacelle structure on a production line basis for power-package build-

(Continued on page 80)

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(Continued from page 79)

up. PacAero acquired 340 and 440 tail jigs from Convair and modified them to the larger size surfaces which are used on the Super Convair.

Along with its aircraft fabrication, PacAero also builds those technical items mentioned earlier which are done by what was the former Technical Products Division, now Flight Support. When Technical Products started producing items formerly built by Flight Support in New Jersey, the product line became bigger than either Flight Support or Technical Products had offered before.

Like its parent PacAero, Flight Support also has an engineering staff, and can and does bid on research and development contracts for items which fall in its specialized fields, as well as bidding on hardware production contracts alone.

Another Flight Support effort is in Spraymat, the D. Napier & Son, Ltd., electrical ice-prevention system for aircraft surfaces, for which PAC has the American rights. In addition to putting Spraymat on commercial aircraft, Flight Support also is putting it on Lockheed's F-104 Starfighter inlet ducting, for USAF. Negotiations are under way for providing Spraymat for the German and Japanese F-104s as well, the Spraymat to be fabricated and formed in Santa Monica, then shipped abroad and bonded to the airplane.

While Chino was PAC's deepest involvement with the military, work in the engine division from 1950 to 1953 became entirely military due to the Korean war. Commercial customers were unable to get the service they wanted and needed.

Thirty years ago (in 1930), PAC was authorized to overhaul Pratt & Whitney engines and, over the years, this relationship has grown to where PAC now is a "western East Hartford." P&W has a full-time man at PAC, required by the new engines with which PAC gets involved.

Due to the geographic advantage, when new models of engines are delivered to west-coast airframe manufacturers, and while they are undergoing flight test at Edwards Air Force Base, PAC does required rework and modification, saving the time and cost of shipping the engine east and back.

Working with Convair, Chance Vought, Douglas, Boeing, North American and others, PAC becomes deeply involved early in the life of new engines, which mostly start as military developments. The know-how gained in this work is invaluable when these powerplants reach the commercial market.

In recent years, PAC has become the U. S. agent for Rolls-Royce, overhauling Dart turboprop engines for U. S. airlines. Like P&W, Rolls keeps a full-time man at PAC.

PAC also will overhaul the Rolls-Royce Tyne turboprop engine to be used by Flying Tiger Line, Inc., in its CL-44 airfreighters. A contract calling for overhaul of a minimum of 300 engines and accessories over a four-year period starting July 1, 1961, was signed recently between PAC and Tiger's. Overhaul cycle time will be 21 days for the 5,730 ehp. powerplants,

(Continued on page 82)

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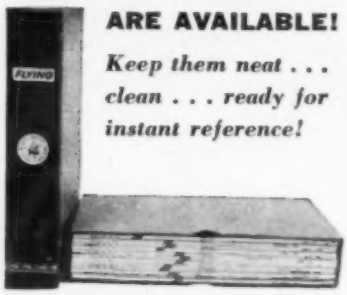

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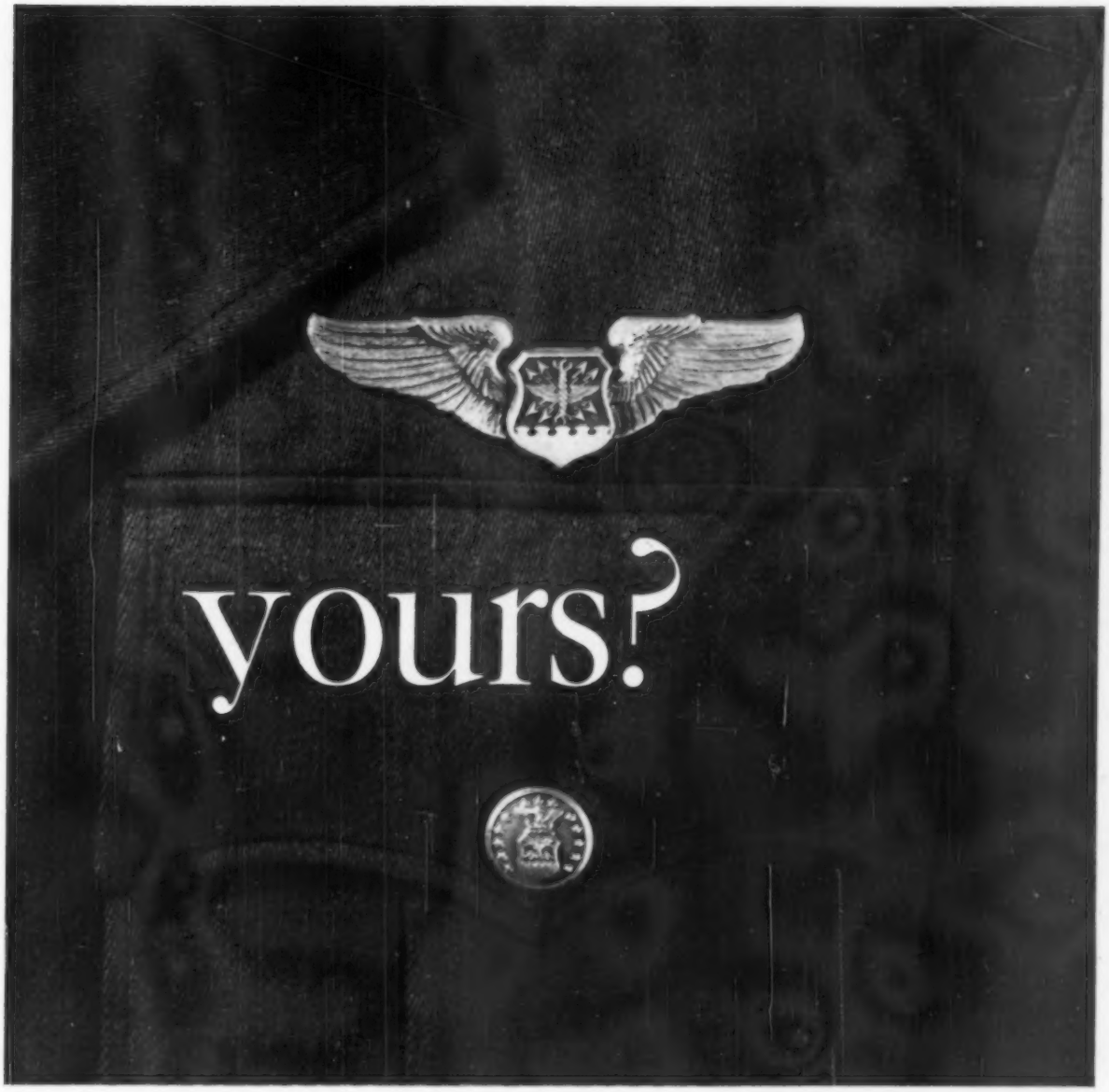

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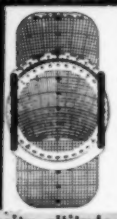

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(Continued from page 80)

and minimum value of the contract will be $6 million. If aircraft utilization rate anticipated by Tigers is achieved for the CL-44, probably 100 Tynes per year will be overhauled.

To meet the requirements of being able to do anything the manufacturer can do in engine overhaul, PAC has invested considerable money in its facilities, some of which are unique.

One special item is a turboprop test cell, built some time ago to specifications calling for capabilities well beyond the normal for that period in thrust levels it could accept, and also a feature by which the test stand part of the cell can be rotated 180 degrees to test either American (clockwise rotation) or British (counterclockwise rotation) engines, using the same dynamometer unit.

Another way-ahead equipment item is a fuel control test stand which can handle flow rates from those of the small Dart turboprop up to 64,000 lb./hr. required for a very large, high-thrust turbojet.

The combined facilities and know-how have put PAC in a position of being able to work on engines such as the P&W J-58 of some 25,000-lbs. dry static thrust, if the need arises, along with the JT3-MC6 and JT3-MC7 fan versions of the JT3-C6 and C7 turbojet engines used on Boeing and Douglas transports. Probably, when the time comes, PAC will make the conversion of many of these commercial turbojets to the fan configuration.

Currently, PAC is putting through 14 turbine engines per month in its regular commercial overhaul line on schedule, with what military work it does for airframe, engine and USAF test activities, put through in addition.

PAC's airline customers for turbine-engine overhaul include Western, Continental, Aloha and West Coast. Also, PAC handles work on an "as required" basis for QANTAS, the Australian airline, between Honolulu and London.

In piston engines, the backbone of PAC's overhaul activities, the smallest being worked on now is the flat-six Continental 10470 used in the Cessna 310. However, PAC may extend its efforts down to the smaller flat-fours if this can be done competitively and profitably. PAC gives a 500-hour workmanship guarantee on all its engine overhauls, and the level of workmanship this demands makes doing small engines more expensive for PAC than for smaller shops.

One of the largest sources of PAC's piston-engine business is the supplemental carriers. The extent of this work, plus the flow of corporate and business airplane overhauls, has enabled PAC to develop an exchange engine program for all sizes of engines from the four-row Pratt & Whitney R4360 down to the horizontal-opposed flat-six category.

Right now, PAC has a substantial number of overhauled R4360s, probably the largest outside of USAF, and while applications are lacking at the moment, has high hopes something may come along.

With its engine stocks, PAC is in a position to do business on a leasing basis, through Pioneer, as well as on an exchange basis.

Complementing the engine overhaul facilities are the accessories and propeller overhaul shops. A customer can have the entire power-package overhauled by one agency, can get exchange equipment, or his own, back in first-class shape. Ability to handle the entire power package in-house gives PAC a cost advantage which can be passed along to the customer.

One part of the engine division which does a substantial business on its own (average, $75,000 monthly), is the parts supply store which, in addition to stocking the parts used in the overhaul shop, also handles lines of merchandise for which there is no distributor mark-up allowance, and could be bought anywhere for the same price. By having these items in stock, PAC can draw customers who also may buy additional service or products on which PAC gets the distributor allowance.

The products division, as it is popularly termed, is PAC's most extensive activity, geographically speaking, with branches in Honolulu, Seattle, Oakland. Formerly there were PAC locations in Denver and Kansas City, but two years ago the east-of-the-Rockies sites were changed to the Mid-Continent Airmotive subsidiary, and new branches established at Chicago and Tulsa.

Biggest customers of the products division are airlines, which account for two-thirds of the volume. By 1961, the goal is to increase redistribution sales (to retailers) to where the total volume will be spread half-and-half between airline and general aviation.

The products division sells to other PAC activities (engine division, aircraft service, PacAero, etc.) on the same basis as it sells to any other retailer.

For its airline customers, the division has devised a spares provisioning system known as Advance Planning Service (APS), which enables the airline to stock only a two-month spares supply instead of the usual six months level, with PAC assuming responsibility for the remainder. PAC cites a substantial saving to the customer in capital outlay, storage and handling costs, technical obsolescence and indirect costs such as insurance.

To increase its general aviation sales volume to equal the airline volume, PAC's products division has developed a new approach known as the "associate distributorship." This makes use of a fixed-base operator located in key trading areas (determined by aircraft registration research), who maintains a stock of "bread and butter" parts to supply other retail shops on his field and in adjacent areas.

The associate distributor usually starts with a basic stock of about $1,000 worth of tires, batteries and spark plugs; can expand according to his sales output, since he gets a part of the distributor mark-up allowance —which normally would all go to PAC. For example, PAC would pick a fixed-base operator in the San Diego area, probably at Lindbergh or Montgomery Fields, who would supply other retail shops on his airport, plus those on nearby fields such as at Del Mar, El Cajon, National City, etc.

Pushing the associate distributorship program into high gear, products division is setting up a staff of salesmen-pilots who will cover fairly large territories on both sides of the Rockies, for while Mid-Continent Airmotive is a subsidiary and

would report administratively to PAC president Robert Earle, its work is identical to that of the products division and it is directed functionally by products manager Jack Craig who is in charge of the associate distributorship program under the direction of Roy Backman.

These salesmen will be working in two directions—determining the proper fixed-base operators in the selected areas to set up associate distributorships, then selling them on taking on the associate distributorship, and developing corporate accounts.

Frequently the oldest and best established operators already are selling product lines other than those carried by PAC, and want to stay with the lines they have. Then the PAC men carefully scan the most promising other prospects, such as newer or smaller operators, select one who appears to be aggressive and progressive. PAC approves the selection, and helps them get established with the basic merchandise to start associate distributorship, and lets them expand from that point.

PAC salesmen also will be cultivating corporate accounts in their areas, and when the entire program is operating as planned, the salesmen will be able to concentrate on corporate accounts while the associate distributors will be pushing sales to direct retailers.

Additional sales of aviation products is handled by Pacair in foreign countries. Pacair also has representatives in 20 countries to handle sales in these areas, but also maintains a Washington, D. C. staff which deals with officials of foreign governments who are involved in product purchases for their air forces or national flag airlines. Thus, the Washington staff would be the actual sales agent in a contract involving parts for Air France or the French Air Force, negotiating with either the French Air Attache's office or with a French purchasing mission. END

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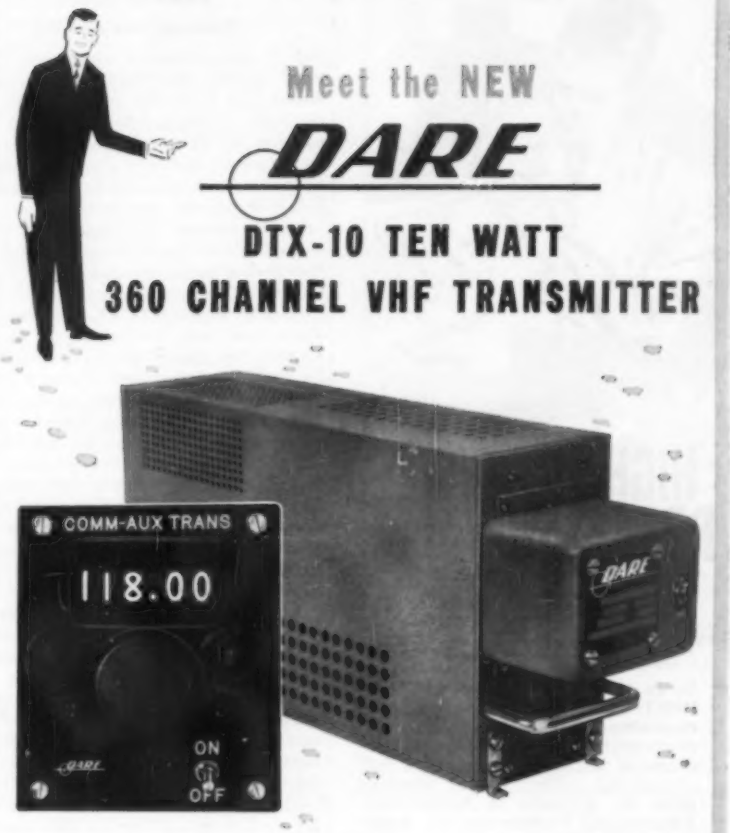

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Boeing 720

(Continued from page 28)

and the elimination of trim power "wrestling" makes the whole process easier. Above 250 knots the rudder boost automatically is dropped from 3,000 to 1,000 psi, but in all speed profiles, with symmetric power, rudder is almost unnecessary. In fact, normal turns can be made with the ball in the center, feet on the floor.

Another concern of "swept-wing" pilots—the effects of "tuck" (see box) at high speeds—has been corrected by the installation of a Mach-trim compensator system. Even without the MTC on, however, only a slight tuck will develop below .9 Mach (Vne—never exceed speed)—so small as to be easily overcome with elevator control.

New pilots checking out on the 720 are most interested in what happens to the wing on the final approach. "It's like seeing one of those exploded drawings," said one, "for the fully activated 720 wing looks like 'a cross between a Molotov cocktail and a mixed-up erector set.'" It is equipped with leading-edge flaps, large trailing-edge flaps, fillet flaps, Vortex generators and combination speed-brake spoilers.

The leading-edge flaps present an unusual appearance but give great advantage in the distance required for takeoff and in a lowered landing speed.

Although the very favorable power/weight ratio of the 720 makes it, as United says, "the nation's newest jet . . . Boeing's fastest," the 720 is only a few knots faster than a DC-7 on final approach at its highest landing weights. "When we're light, we get tired of seeing Convair 340s pass us to land on the parallel runways," says Capt. Carl Wood, United instructor.

The maximum landing weight for the airplane is 175,000 pounds, with a V-reference or threshold speed of 130 knots. Boeing recommends that a five-knot "fudge factor" be added to this basic speed in light wind conditions to make up for such variables as airspeed-indicator errors, differences in wind velocity between the tower sensing point and the ground, etc.

The Boeing instructors also recommend that half of the head wind component, up to 10 knots, be added to the reference speed—and in addition, the full gust factor of the wind component. If for some reason the leading-edge flaps were unavailable, 10 knots would be added to the flare speed, 30 knots if no flaps can be obtained (a remote eventuality, as it would presuppose a triple system failure).

Boeing pilots discourage nose-high landing attitudes. For maximum pod clearance, they teach a technique where the pilot flares to almost a level attitude, then eases off the power and holds the attitude, allowing the airplane to "kiss on" without any further flare attempt. Oddly enough, these landings are surprisingly smooth.

Most critical, from the pilot's standpoint, is landing in a strong cross wind, where the airplane must be kept perfectly level as it touches down. As the gear is rather narrow, there is a real danger of touching a pod if the old, tried-and-true technique of landing wing-into-the-wind is used.

As the lateral control is so effective, the new pilot tends to overcorrect once on the ground, which can cause the airplane to "bicycle" a sinuous path down the runway.

As soon as the main gear is on the ground, the captain extends the spoilers by means of the speed-brake handle, and the first officer reverses. Boeing recommends pilots begin use of wheel brakes immediately after the plane is solidly on the ground. Unlike the DC-8, which uses "buckets" on big ejector tracks for reversing, the 720 has the standard Boeing installation of cascade vanes and non-extendable clamshell doors for reversing. Ground handling is good, although, unlike the DC-8, no nose-wheel steering is incorporated into the rudder pedals. Boeing pilots recommend that nose-wheel steering be used on landing only after braking has been completed—this technique, of course, to keep from "scrubbing" the nose gear.

United's training program consists of three weeks of intensive ground school, a week (20 hours) of simulator and an average of about 14 hours of airplane time for captains. The company has a new, million-dollar Boeing 720 simulator, built by Link Aviation, which incorporates a closed-circuit TV visual landing system tied in with its DC-8 simulator.

Training is concentrated at Denver, with alternate training being done at San Francisco, when, as happened this summer, the former city had to shut down its jet runway for major repairs.

The rating ride in the 720, given by an FAA inspector and a company standards board flight manager, averages about three hours. It includes engine loss on takeoff, an intentionally complicated departure procedure, and an airwork session, which includes stalls, steep turns, rapid-descent and pull-up, and slow flight. Also included at altitude are two-engine approaches and missed approaches, recovery from unusual positions and Dutch-roll, emergency procedures and trouble-shooting of major systems, and an emergency descent from 30,000 feet.

The last half of the hood check normally is made up of a three-engine ILS approach and missed-approach, a no-flap approach, a jammed stabilizer approach and landing, the cross-wind takeoff, an ADF approach, circling under a simulated low ceiling; and a cross-wind landing.

Stalls in the airplane are done "clean" and also from a 30-degree flap configuration out of a 25-degree bank turn, and again from a full-flap, gear-down configuration. All are done at 65 per cent of N1 (front-spool) power setting. On the rating ride stalls are carried two or three knots into initial buffet.

A Safe Flight stick-shaker of a conventional type is installed on the 720 and gives its rattlesnake warning well in advance of the stall. A slight tail buffet, coming well in advance of the wing stall, also acts as a good warning "device."

Although the speed brake will be used little with passengers because of the buffet induced, it is a handy gadget for use in a bind. The first 30 degrees of spoiler extension gives a pitch-up tendency, while the last 30 degrees is almost pure drag. Jammed stabilizer problems are easily cured by use of a symmetric flap and spoiler. Unlike the DC-8, which can be reversed in flight,

thrust-reversing on the 720 is confined to the landing roll.

Even at 10,000 feet, the pull-out and go-around characteristics on two engines in the 720 are good. At sea level the problem on a go-around with two engines dead on one side would be from too much power; the pilot would have to be judicious in getting his power up so as to control the roll into the inoperative engines.

Systems on the airplane are generally simple, having been refined by Boeing's years of experience on this type of aircraft.

The 720 cockpit layout is very similar to the DC-8, with flight instruments for captain and first officer in the basic T-configuration. One difference in engine instrumentation is that, on the 720, the N1 (front compressor) tachometers are installed on the front, center panel and are used to help simplify the pilots' job in setting power. On the DC-8 they are located on the S/O (second officer's) panel.

Other engine instruments on the forward panel include exhaust gas temperature (EGT), exhaust pressure ratio (EPR), N2 (rear-spool) rpm, and fuel flow. Additional instrumentation in the 720 includes a flight recorder, an ATC transponder, autopilot and radar. Provision has been made for the later installation of both DMET and Doppler.

The aircraft's anti-ice and de-ice protection consists of electrically heated windshields and tail surfaces, with the wings and engine inlets being heated by bleed air from the engines.

One major difference in technique required for pilots coming from standard reciprocating equipment is the necessity for the most part of making approaches with one hand on the wheel and one hand on the throttles for exact airspeed control. The great span of landing weights possible in the airplane militates against memorized power settings.

Perhaps the most shocking part of an observer's first flight is the takeoff climb angle. With a light airplane, the angle has to be in the vicinity of 20 degrees or higher if the standard V2-plus-10 climb is to be used; consequently, at the lighter weights, the pilots are instructed to restrict the climb angle to 15 degrees on the artificial horizon for better forward visibility and passenger comfort, taking the increased airspeed as a bonus.

The 720 is a "pilot's airplane." Like the DC-8, it is at its best in slow maneuvering around a field, where it handles "easily but solidly." Yet, the pilots also like its high-speed capability—and its "fighter plane" maneuverability.

As a result of Boeing's years of turning out large jet aircraft, the 720 has come to the airlines as probably one of the finest airline instruments ever purchased. In all of the initial training at San Francisco, covering a span of about five weeks, this check aircraft never broke down. It began to become a joke among the pilots and maintenance personnel, for time after time the only comment on the log book was "wash the windshields."

Already the 720 has made airline history with its "go-go-go" capability. By the same token, it should be a real money-maker over the years for the airlines. END

BOEING 720

Performance:

Maximum operating altitude	42,000 ft.
Normal operating limit speed (Vno):	
Sea level	342 kt. IAS
6,000 ft	350 kt. IAS
10,000 ft	383 kt. IAS
23,500 ft	397 kt. IAS
Above 23,500 ft	Mach .9
Never exceed speed (Vne):	
Sea level	385 kt. IAS
18,000 to 23,500 ft	400 kt. IAS
Above 23,500 ft	Mach .9
Maximum permissible weights:	
Gross (taxi or in-flight)	213,000 lbs.
Zero fuel	139,000 lbs.
Landing (main or reserve tanks can be full)	175,000 lbs.
Flap speeds:	
20 degrees	220 kt. IAS
30 degrees	210 kt. IAS
40 degrees	200 kt. IAS
50 degrees	185 kt. IAS
Landing gear operation (extension & retraction):	
Extending and retracting	270 kt. to 30,000 ft.; 280 kt. above
Speed w/gear extended	285 kt. to 27,000 ft.; Mach .83 above
Recommended rough-air speed (Vb)	260 kt. IAS
Maneuvering speed (Va)—max. for full throw of primary controls:	
Sea level	241 kt. IAS
20,000 ft	246 kt. IAS
30,000 ft	257 kt. IAS
40,000 ft	272 kt. IAS

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THE THRUST LEVER

By CAPTAIN DAVE KUHN

THE JURISDICTIONAL union dispute between pilots and engineers in commercial jet aircraft is doing no one any good.

A review of how this self-induced canker came about may be helpful. Admittedly, a one-union cockpit is most desirable. There can be no real harmony on the flight deck until such is effected. The obvious answer to this is merger.

The flight engineer came into the crew picture about 1940 when TWA and Pan American bought pressurized Boeing Stratoliners. They could climb to 18,000 feet with no sweat. Management wanted to put a third pilot at the third station. The pilots' union (ALPA) would have none of it. They quoted the CAR definition of a pilot. They pointed out that a mechanic could fill the spot. His knowledge of how a plane was put together would make him very handy in flight.

This made sense. (The engineers think it still makes sense.) Management agreed. To tie it down, the pilots' union appeared before the CAB in Washington and aided in having the law changed. All multi-engine planes of over 80,000 pounds must have a flight engineer.

Subsequently, the DC-6 and Connies came into the picture. Here is where the rub began. These new monsters had a capacity eight times greater than the DC-3. Fewer pilots would be required to man an airline. Rather than furlough pilots, some of the airlines were receptive to the idea of a pilot in the flight-engineer seat. A real mix-up ensued. Each airline had its own crew formula.

The engineers, repeatedly having been denied admission in the pilots' union, formed one of their own. Each time the pilots' union negotiations gained some advantage, the engineers' union would climb on the band wagon and, in some cases, better the provisions so recently earned by ALPA.

By 1950 the caldron came to a boil. On occasions there was open dissension in the cockpit. At times, a pilot would order a flight engineer off the plane. On one airline the feeling became so bitter that chalk marks were made on the cockpit floor to show the areas of responsibility. Since crew coordination is vital in flight, most will agree that such an undesirable condition is quite unhealthy.

Then came the jets.

By union convention time, 1956, the pilots thought it necessary to end this situation. They amended the bylaws to permit flight engineers to be members of their association. However, the same convention adopted policy outlawing mechanics as flight engineers on jets. A "Jet Study Committee" reported on pay rates and working conditions, and went beyond the intended scope to set up policy on the jet crew complement.

It stated, "All members of the operating crew shall be pilot qualified." Further, "No turboprop or jet-turbine-powered aircraft will be operated unless, and until, it is manned at all flight stations by a qualified pilot in the employ of the company as pilot."

This would have been fine except for one thing—the flight engineers refused to play dead. ALPA referred to the crew complement as the "fail-safe concept." In its new role of rule maker, the pilot union elected to negotiate the "fail-safe concept," rather than take the matter before the then CAA for implementation.

From the flight engineer's viewpoint, it is easy to understand the objection. The engineers' union holds a valid charter under AFL-CIO. They hold legal working agreements negotiated under the Railway Labor Act. They like to own homes, eat, and make the payments on yachts and sports cars plus the added luxuries of wives and children.

The Jet Study Committee argued that there was nothing for a third man to do on a jet. "All was done automatically by little black boxes and hence no need for a third man—especially with mechanical skills." What the engineers could not grasp is how a pilot was better qualified than a mechanic to do nothing!

A group of mature pilots, attempted to soften the mandate by passing a resolution in a council that would amend policy to allow the pilots on each airline using jets, to vote on what they desired in the third crew member. The resolution was never processed. Those that proposed it were disciplined.

As the battle lines formed, United Air Lines management offered their engineers some flight training. This partly satisfied the policy. Since many engineers were pilot trained already, it was not a great hurdle. A head count showed a majority of this group was on the pilots' seniority list. A vote was taken among these engineer-pilots to see if ALPA had jurisdiction over them. To put it mildly, there was

consternation when the tally showed a majority preferred to be represented by the engineers' union (FEIA).

Since this was entirely unsatisfactory to ALPA, a class and craft hearing was set up before the National Labor Board. As of this writing there has been no decision. The decision (if any) still may not solve the problem, since many labor unions intervened in behalf of the engineers.

In 1958 the real contest started on Eastern Air Lines. What happened is now a matter of record. Both the flight engineers and pilots took strike votes. The pilots were poised to strike but the engineers beat them to it. The one main issue: who gets the third seat? Almost everything else was left out of the negotiations.

Finally, Mr. David Cole headed a fact-finding board. After a long and costly hearing, a settlement of sorts was found. The pilots agreed that a third pilot was not needed on the turboprops. They also agreed that giving the engineers a minimum of flight training would meet the requirements of the "fail-safe concept."

Before Mr. Cole's recommendations could be put into effect, American Airlines made a move. With jets ready to fly, they adopted the two-pilot-and-engineer on turboprops, but added a fourth man to the pure jets—a pilot. Quickly, Eastern, Pan Am and TWA latched on to the very same crew setup.

Instead of unloading the FEIA, the problem was compounded. Today, there is a conglomeration of crewmen manning our commercial jets. Some cockpits have two pilots and an engineer, some three pilots and some three pilots plus an engineer. As one American captain reported, "Delta brings the DC-8 to Dallas with three crewmen, and we need four to get it to Los Angeles."

The third pilot in a four-man crew is referred to as a second officer. His seat is directly behind the captain's, close enough to allow the captain full benefit of his cigar smoking and seat kicking. This is pointedly called "riding shotgun."

The problem is that these pilots are good boys who hired out to fly. For the most part, they detest the assignment since it is possible to grow old "riding shotgun" and rarely, if ever, be called on to use the skills for which they are qualified. True, they can, and do, relieve the copilot of some of his chores. They read the check list, keep the log and do some of the radio work. This leaves the copilot free to direct his full attention to operating the gear and flaps, and looking out for traffic. Certainly, putting a fourth man in the crew did not lessen the confusion. As one captain observed, "It is a team effort, but the team is too big."

In 1958, Congress passed the Federal Aviation Act, creating the FAA. This agency is empowered by the Congress to make the laws covering aviation, including crew qualifications. The administrator stated that the jets were certificated for a crew of two pilots and an engineer. This started a feud. When FAA inspectors boarded a jet for routine checks, they moved the second officer out of his seat in order that close observance of the operating crew might be had. Eastern and the Pan Am pilots became ill. Many flights didn't run. It took a court injunction to restore pilot health.

The pilots' union complained that three pilots are needed on jets since the "old man" may drop over. (On propeller-driven equipment, this danger apparently did not exist.) The Administrator promptly replied by making a rule for mandatory retirement at age 60.

The union explained that in high-flying jets there is a danger of decompression problems, hence a need for three pilots. The Administrator answered with a rule requiring one pilot to wear a mask at all times above 25,000 feet. The ALPA took the Administrator to court to test his authority to make rules. As of now, the courts still have the case. Betting is about 60 to 40 in favor of the FAA.

There will be confusion, discord, hatred and marginal safety at times on the flight deck until the two unions merge. They must sit down in good faith, neither seeking advantage, and work out an equitable solution where the rights of all are protected. The engineers have never asked for more than preservation of seniority at the third seat. The jet captains will admit secretly that a mechanic-engineer is a most valuable part of the crew.

The myth of the "little black boxes" operating all the systems has been dissipated. The jets are not simple. A crewman handy with a monkey wrench is a godsend at times. With one union in the cockpit, brotherly love, integrity, and esprit de corps would fairly drip all over the flight deck. It must come sooner or later. With all wearing the same union pin, it might be possible for the management once again to hire whom they wanted for the job. It would be possible for the FAA to again set forth the air-crew qualifications.

Released from jurisdictional combat, the union could seek to regain in working conditions, that which was neglected in the round of jet contracts. The speed of the jets nearly doubles the number of trips per month. Foreign carriers already have reduced the monthly time. A reduction in monthly hours would give the "shotgun" an opportunity to be a pilot again. He would like that.

With all wearing the same union pin, there would be true crew coordination. They all would be feeding from the same trough. END

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(Continued from page 49)

we wanted to do. Then I made a follow-up telephone call.

I was told there were two ways the required data could be submitted: (1) By a complete set of drawings showing considerably more detail than the sketches sent the engineer, or (2) by use of coded photographs. The first method would be necessary if we were going to sell kits or extend the approval to more than one airplane, but the second method was recommended, since this was to be an individual job. The engineer said he would be coming to Fairbanks in a few days on routine business.

When the engineer arrived he outlined a procedure by which he or the local FAA inspector would check the work as it progressed and urged us to keep up with the paper work and photographs so that approval would not be delayed when the job was finished.

Dave would do the actual work and I would keep the records of what was done. My hobby of photography came in handy. Here is what the FAA said I was to keep: (1) A parts list showing sizes, type of metal and description of all parts used for the job, either manufactured by us or "borrowed" from another airplane. This was not to include parts described by AN numbers such as rivets, bolts, fasteners, etc. Each part was given a number. (2) A complete set of instructions telling each move was made in the order of occurrence. (3) A set of photographs showing the use of each part listed in the parts list. These photos (8 x 10s, enlarged from 4 x 5 negatives) had the parts numbers written in India ink and also showed other important information—such as the rivet spacing, angles, etc.

I ended up with a list showing 32 parts, six pages of double-spaced typewritten instructions and 24 photographs. I also included one sheet of drawings showing detail that could not be shown clearly by photographs. I even had time to help Dave.

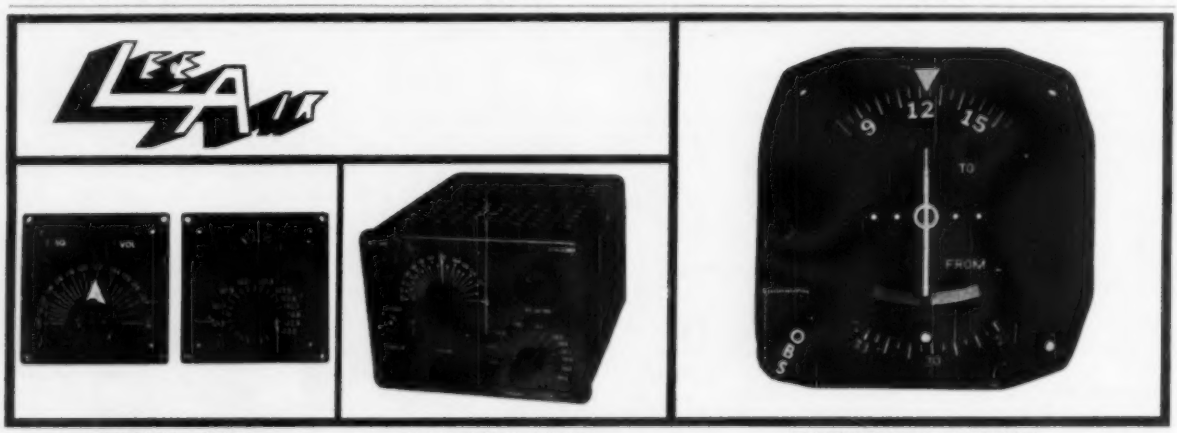
First the entire fuselage was stripped inside and out. Dave built aluminum bulkheads and bolted them to tabs welded to the tubing. The bulkheads were tied together with aluminum stringers (Cessna wing stringer material) running lengthwise to the fuselage. The aluminum skin was attached to these stringers and to the bulkheads. We used .020 24 ST aluminum in most areas, but in places which take the most beating from rocks, like the bottom, .025 aluminum was used. It took a great deal of planning and craftsmanship to get the nice lines that were obtained. Attaching the skin around the windows and doors was no easy trick either.

We worked all the ideas into the job we could think of that would eliminate the headaches experienced with fabric. The bottom of the fuselage consists of five individually removable stiffened panels which can be easily replaced if dented or simply removed to clean out the accumulation of dirt that collects in a fuselage. A metal fairing, somewhat resembling a Luscombe gear cover, was designed for the landing gear.

With the job completed, and after obtaining a temporary experimental certificate, I flew the plane to Anchorage for the final inspection. I met again with our engineer, Dave Beyer, and with John Van Horn, safety inspector from the Anchorage office at Merrill Field, and they gave the plane a thorough going-over. Van Horn found four small items he wanted corrected as soon as I arrived back in Fairbanks. None of them had anything to do with the conversion. Dave Beyer approved the job on an individual basis and issued the first STC (supplementary type certificate) number awarded in Alaska, No. SA5-1. He explained that if anyone else wanted to do a conversion like mine they could use my photographs and instructions as a guide, but would have to substitute their work with a like set of photos.

Part of the inspection consisted of a flight test at gross weight to be sure there was no undesirable flight characteristics or vibration. Upon landing on one of the gravel runways at Merrill Field, Dave was amazed by the lack of the "tin can" effect usually found in metal airplanes—and this without the use of any deadener material painted on the inside of the skin. The conversion added about 40 pounds to the empty weight of the plane.

Everyone wants to know how much it cost. It is hardly fair to give a price of such work done in Alaska, because everything here costs more. I can say, though, that a good dope and fabric job on a fuselage in Fairbanks will run about $600, and a metalizing job like mine would cost, here, about $1,000. END



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Bowman Field

(Continued from page 45)

Brown Suburban Hotel, a motel-type branch of Louisville's long-noted downtown Brown Hotel, and just a mile-and-a-half from Bowman.

The following morning was spent driving around the city, noting surface access roads, distance from the business district, types of residences near the field. And another piece of the puzzle fell into place.

It would be almost impossible to improve upon the location of Bowman Field in relation to business and residential areas and the fine system of express highways tying them together. In the accompanying aerial photograph of the airport, a cloverleaf of the Henry Watterson Expressway may be seen in the upper right corner. Using this entry and going from the Watterson road directly onto the new north-south expressway, which goes to the heart of downtown Louisville, total driving time from Bowman to the business district was 20 minutes.

Driving along the western edge of the airport (bottom of the photograph) into adjoining Seneca Park and the fine residential areas of Seneca Gardens and Cherokee Gardens indicated that any pilots or business executives living there could be at the airport in five to 10 minutes. Going farther out to newer residential sections north and east of the field, the St. Matthews and Indian Hills areas, showed that driving time would be 10 to 20 minutes. With the Kentucky Turnpike feeding in from the south and the Watterson Expressway running generally east and west, no area of the city or adjoining communities is without rapid surface connection with the airport.

This is equally true of Standiford Field, the airline terminal which is even closer to downtown—about a 15-minute drive—and lies on the edge of the industrial section.

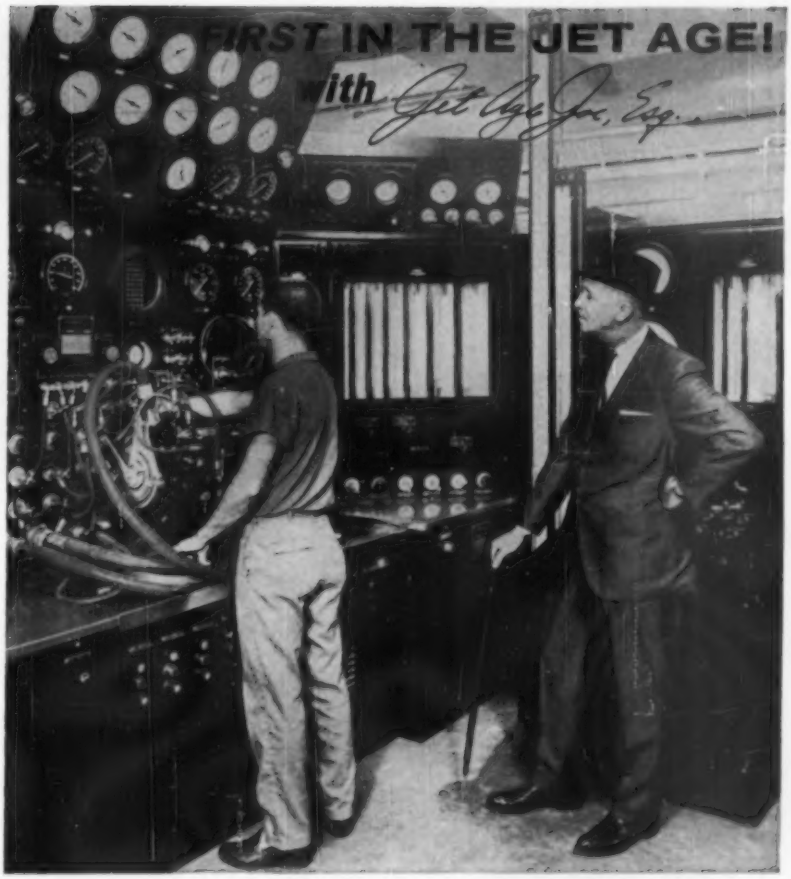
Plainly, ready accessibility of Bowman Field to residential and business areas and neighboring communities has been an important factor in development of its heavy local air traffic. How many more people would take up flying if transportation to the airport were simplified at more cities?

The remainder of my three-day study of the Louisville pattern was devoted to interviews with fixed-base operators, pilots, aircraft owners, control tower and radar operators, businessmen; Foster Jones, Director of Airports for the Louisville and Jefferson County Air Board which operates both Bowman and Standiford; and with Ben Brumleve Jr., present manager of Bowman. Several hours also were spent pouring over 12 large volumes of press clippings covering the history of Bowman since 1919, for obviously there was more to this puzzle than a study of current operations would reveal.

Space prohibits a detailed report of all of these interviews and studies but the following compilation of facts and comments offer food for thought.

For perspective, a bit of history: Need for an airport had been evident since 1910 when Glenn Curtiss flew one of his pushers off of Louisville's famous Churchill Downs. As interest grew, land confiscated from Ger-

(Continued on page 90)



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I'm watching the test of a JT4 jet engine fuel control for a Douglas DC-8. Nearby, technicians are busy with other accessories for airline JT4s and for military J35s and J33s. It is typical of Southwest Airmotive that, when it went ahead with jets, it went all the way!

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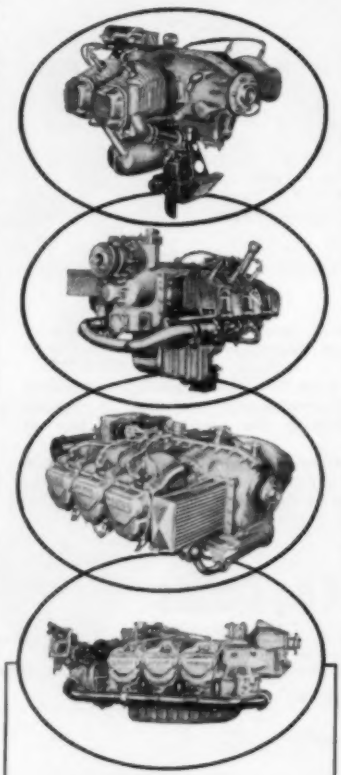

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Wagoner, Okla.

A WOODED 3,000-ACRE peninsula, thrusting out into 20,000-acre Fort Gibson Lake with the Ozark Mountains for background, forms a setting for Western Hills Lodge, 50 miles ESE of Tulsa, 28 miles north of Muskogee.

The National Flying Farmers, the Flying Physicians and National Pilots Associations have already put their stamp of approval on Western Hills by choosing it for their annual conventions. Year-round recreational facilities on land and water represent its basic attraction and, to pilots, a 2,500-foot landing strip (upper right, above) only three-quarters of a mile from the Lodge is of particular interest. The strip is lighted for 24-hour use. There is a wind tee, paved tie-down area and Unicom 122.8, over which a direct call to the Lodge will bring an air-conditioned station wagon to pick up guests.

The atmosphere of this area is built around its Western and Indian background. Regular entertainment at the Lodge includes full-costumed Indian dancers, stagecoach rides and, sometimes, even a stage robbery. Golf, fishing, swimming, water skiing, sailing, hunting, horseback riding, coon hunts, boat and land tours, add up to a wide variety of pleasurable activities.

Operated on a year-round basis, vacation season starts at Western Hills April 15th and continues through September. The balance of the year is heavily booked for conventions. Rates are European Plan. All rooms with view of lake or pool are $7.50 daily (single), to $35 for Lodge suites accommodating four persons. Poolside cabanas, $10.50 to $15, and guest houses $12.50 to $28.50. (Summer rates quoted, and all rates subject to change.)

The Cherokee dining room offers fine foods at reasonable prices and there are seven private dining rooms accommodating from 10 to 950 persons.

(Continued from page 89)

man nationals during the first World War was acquired for an airport by A. H. Bowman, the first plane landing on it in 1919. The field was at that time two-and-a-half miles from the city of Louisville which has since expanded around its 224 acres.

Significant in the airport's early history, and even more so today, was the city's purchase of it by a park bond issue in 1927. It is still a "park," located in an area of parks and, as nearly as could be determined, is zoned as a park, can never be anything but a park. With this protection, Bowman has survived urban development.

Two exceptionally active groups of local airmen – the Aero Club of Kentucky, formed in 1922 and still active, and an Air Reserve unit of former World War I pilots organized in 1923–kept the field busy. In the 20s this primarily was flight training and sport flying. Perhaps in an area where the "Sport of Kings" is a tradition and the famous Kentucky bluegrass pastures of horse breeding farms are the heart of a

(Continued on page 92)

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The Marquis de Portago with world champion Juan Manuel Fangio at the French Grand Prix.

Alfred Neubauer, Stirling Moss (right) and Denis Jenkinson after their 1955 Mille Miglia victory.

The Cooper team, left to right: Jack Brabham, Bruce McLaren, John Cooper.

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Moss (11) and Brabham (8) taking a corner at the Dutch G. P. Zandvoort

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(Continued from page 90)

quiet, conservative but sporting way of life, it was not so unusual that the new sport of flying found ready acceptance.

But it didn't remain solely a sport operation and a potential military weapon for long. By the late twenties, numerous airmail routes were being laid down and Bowman played a pioneering role in several. American Airlines, as it now stands, traces some of its roots to Bowman through purchase of a company that had started a mail service between Louisville and Cleveland in 1928. Eastern, another of the lines still operating out of Louisville, inaugurated mail and passenger service between Bowman Field and Chicago in 1934.

During the disastrous flood of 1937, Bowman field, situated on high ground, was the only means of access to and from Louisville. American and Eastern Air Lines, and many private and Air Reserve pilots flew in vitally needed food and medical supplies, proving beyond any doubt the worth of air transportation and bringing the airport into the affectionate regard and appreciation of the community.

Although concrete runways were built in 1938 to accommodate the increasing needs of airline service, it was already evident that a second airport would be needed and the planning and building of Standiford was undertaken by the Air Board. However, war intervened and it was many years before the airlines could move in.

With war preparations under way by 1940, Bowman was placed at the disposal of the Army Air Corps and for the duration was Bowman Field Air Base, a flight training center for thousands of airmen and eventually an Army hospital and air evacuation center. Spring of 1946 saw all military personnel and equipment moved from the field, leaving only their rows of barracks and service buldings, a large hangar and acres of cement hardstand to recall their presence.

By 1947 the airlines had moved into Standiford and Bowman became once again the haunt of sportsmen and students. "Haunt" is hardly the word. "Beehive" would be more accurate for, at the height of the G. I. Bill flight training program in 1947-48, there were 22 flying schools on the field. Eventually, this simmered down to the present four operators: Kentucky Flying Service, Kentucky Air Transport, Central American Airways and Louisville Flying Service.

Highly competitive, the four have tended to drive each other's rates down and therewith another hunk of the puzzle plunks into place. Lowest rates and heaviest volume of flight training (about 250 students, including 50 VA and eight AF ROTC) are at Kentucky Flying Service, a Piper dealer and Champion Aircraft distributor. The rates:

	Solo	*Dual*
Aeronca Champions	$6	$9
Champion Tri-Travelers	7	10
Piper Tri-Pacers	12	15
Piper Comanches and Cessna Skylanes	20	23

When the company president, Dick Molloy, commented that their volume of 800 to 900 hours a month makes the low rates possible, I couldn't help but wonder if it

isn't the low rates that make the 800 to 900 hours possible—in fact, inevitable.

Another student attraction is offered at Louisville Flying Service, one of the oldest Piper distributors in the nation, where constant replacement of its Super Cub trainers keeps the student always flying an aircraft "that smells new." The Cessna dealer, Kentucky Air Transport, also rotates its trainers every year, using new 150s.

All four operators evidently make a real effort to keep their students and pilot customers abreast of latest techniques and to advance their skills. All give instrument training in well-equipped aircraft. Central American Airways emphasizes advanced training, uses a Link and Skylanes and Bonanzas and is the only operator on the field to give ATR training. The company also operates contract instrument flight courses for the Army at Augusta, Ga., and Fort Knox, Ky., and has a fixed-base operation at Seymour, Ind., 50 miles north.

Important to newly licensed pilots and non-aircraft owners is the availability of very good rental planes at reasonable rates. This tends to keep pilots coming back after their flight training and in some measure adds up to additional "local" flying. However, these flights soon become itinerant, with pilots expanding their range of aircraft use until finally many purchase a plane. Sales are reasonably good in the area. All of the hangars are full and the general impression throughout is one of an approaching need for additional facilities.

There is room on Bowman for some additional hangars, but if business is to expand very much some of it will have to move to "satellite" fields. And there are practically no outlying airports in the Louisville area . . . one turf strip, Haps, five miles north in Indiana; another, West Point, 20 miles south; a new one 40 miles south at Elizabethville, operated by Kentucky Flying Service; and Central American's base 50 miles north at Seymour. This is hardly the satellite complex of airports you would expect to find around a city the size of Louisville with its 750,000 metropolitan area population. Therefore, Bowman serves pretty much all of the area.

With such heavy concentration of air traffic at one field, I was particularly interested in visiting the control tower to see what the operators there had to say about the problems inherent in controlling the world's heaviest local air traffic. They didn't seem particularly perturbed by their beehive but the chief operator did ask me to pass along a plea to lightplane pilots to listen before they initiate a call.

Unfortunately, most lightplane pilots cannot hear both sides of traffic conversation, being able to receive only on the tower's published frequency and having to transmit on the standard tower frequency of 122.5. Too often the silence they may hear is merely a period in which another plane is transmitting. If they barge into that "silence," they help neither themselves nor the tower. So the word is not just to listen, but to tune in sooner and listen longer.

Those of us who have two receivers and are able to transmit simplex on the tower's published frequency so other planes can hear both sides of our contact, would do well also to tune the other receiver to 122.5 and run both receivers through the loudspeaker at sufficient volume to hear all the talk that is going on.

Control tower crews in Louisville are rotated every week between Bowman and Standiford towers so that all operators are kept in tune with both types of traffic. Since the two fields are so close (rumor has it that one airline docks its pilots a month's pay for landing at Bowman by mistake), this makes for good traffic control.

And so the pieces of the puzzle had all fallen in place. Bowman Field has the world's heaviest local air traffic for some very good and solid reasons: Excellent location, superb ground access roads, three-way runways, no airline or military traffic to confuse the issue, low rates, no satellites to drain off business, new equipment, four good fixed-base operators—all the elements which, combined, would have kept most airports around the country piling up heavy local traffic statistics.

But I had traded my Bowman Field local traffic puzzle for one equally perplexing and for which no ready answers seem available. Regardless of the heavy interest in flying at Bowman, there is remarkably little business flying. This just doesn't quite make sense and certainly does not follow the pattern elsewhere in the country.

Nor are the business planes using Standiford with its three runways—two of 5,000 feet and one of 7,800. There is a fixed-base service operator on the field, Falls

(Continued on page 94)

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(Continued from page 93)

City Flying Service, which is said to have a good maintenance and overhaul shop located in a large, former military hangar. But the day I visited Standiford there was one Aero Commander parked near the hangar and a Cessna 195 inside. Principal activity appears to be a production line for aluminum boats. Across the field and just west of the tower there were four business planes in a tie-down area—two single engine, two light twins.

Of the 127 planes based on Bowman, 28 are registered in corporation names including 13 single-engine, 11 light twins, and four heavy twins—the latter being two DC-3's owned by Brown Forman Distillers, and two Twin-Beeches, one owned by Anaconda Aluminum, the other owned by Standard Oil.

Aircraft salesmen tell me that Louisville is one of the toughest business plane sales areas in the country. Most sales are made to small firms where one man must find ways to do the work of three in order to compete with larger firms. One reason given for the tough sales situation is that most of Louisville's large industry, such as GE, Ford, International Harvester and Reynolds Aluminum, is composed of branch plants, while business aircraft fleets usually are based in the headquarters city. Another reason was the availability of so many good charter aircraft at Bowman.

Four salesmen each told me that the most frequent reason given by Louisville businessmen for not buying planes is that the airlines provide adequate transportation for their needs. Score one for whatever group of city fathers was responsible for planning the expressway from Sandiford to the business district, giving the airline traveler, at least at one end of his journey, a 15-minute ride to and from the airport.

Yet these cannot be the only reasons why business flying has not fully taken hold in Louisville. There are too many off-line points to be reached by today's businessmen for the airlines to be able to fully satisfy business air travel needs.

Louisville's civic leaders are making a major bid for the city to become the gateway to the Ohio River Valley's industrial empire. If this eventuates, Bowman's future undoubtedly lies in the service of itinerant business traffic. END

Place in the Sun

(Continued from page 29)

branch line station in the Scottish Highlands.

In 1959 there were 127,000 operational movements at London airport. I understand the figure for New York International was 223,921, and perhaps even higher in Washington, Chicago and Los Angeles. And, since Croydon was closed despite the protests of all private flyers in Britain, we have nothing comparable with Teterboro, N. J. (212,577). If a private pilot in England, with Croydon closed and London banned, is unable to find an airport and puts down on a disused Royal Air Force airfield, he is fined $600.

So here is the danger. Authority can interpret things in its own way and, if it is nervous, it will interpret them in the way

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of restriction. It is always by far the safest course to stop people from flying altogether. The power is there. In England this power is being employed too widely. I suppose it could happen in the United States although the volume of general aircraft utilization seems to preclude such a dismal prospect.

France takes a more liberal view of flying (and a good many other things) than Britain. Her attitude towards small aircraft has been benevolent with the result that some interesting French light craft, such as the 45-hp single-seat Turbulent, have appeared and are now being built in England. British pilots take advantage, when they can, of the more ample and open flying conditions of France. But again United States pilots are lucky. They are less harried by national frontiers.

When a British pilot wants to leave grand-motherly England for a weekend in France, he has to think of customs officers and, as is well known in every part of the world, customs officers hate all travelers. So the British pilot must have a customs carnet which, for a British registered aircraft, is obtained from the Royal Aero Club. This entitles him to make flights in any of a score of different countries, including France, Belgium, Italy, Spain and West Germany. For an aircraft not over 5,000 pounds in weight the cost of a one-journey carnet is three dollars and there is a returnable deposit of 15 dollars.

Before the pilot leaves England he must give his flight plan to air traffic control. And he must carry with him ten different documents: passport, pilot's license, insurance policy, radio license, WT operator's license, certificate of airworthiness, certificate of registration, journey logbook, customs carnet and refueling carnet.

The navigational precautions are extensive because England, being so small a country, the airways, control zones, communications zones and restricted areas are all over the place. Over the English Channel the Ministry of Aviation retains its grip on the pilot. In visual conditions the recommended height outwards from Folkestone to Cap Gris Nez is 3,500 feet and on the return 2,000 feet. The French airports are friendly and their freedom from official interference seems to the English pilot (but would probably *not* seem to the U. S. pilot) to be out of this world.

Because their use for touring and for business journeys is so restricted by regulation, some light aircraft in Britain are switched to sporting contests. Every year there are a dozen or so air races, short in length, with modest prizes and all rather inconsequential compared with the kind of races that are held, so I am told, in the United States. But they offer some aeronautical satisfaction. The chief race is for the King's Cup, a cup given by King George V and competed for annually, sometimes across country, but now more often round a pylon-marked closed circuit.

Then there are the aerobatic contests. Here is the one area of activity where I feel that the British pilot is luckier than the United States pilot. Aerobatics has made rapid strides in Europe recently. This is largely the outcome of the success that

(Continued on page 96)

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(Continued from page 95)

has attended the annual contest for the Lockheed Trophy. This is an international event first held about five years ago at Baginton Airport, Coventry. Five or six different countries send pilots each year, among them France, Belgium, Germany, Switzerland, Czechoslovakia, Holland and Spain.

My impression is that aerobatics are no longer appreciated in the United States. I refer to the art of manipulating an aircraft rather than to spectacular exhibition flying. In the Lockheed Trophy event a minimum height of 100 meters (330 feet) is laid down and each pilot is given five minutes for his display. The complexity and beauty of their exhibitions are something completely new and extremely arresting.

Pilots like Biancotto, the Frenchman, and Liardon, the Swiss, can hold the attention riveted with masterpieces of handling and judgment, the figures being so linked as to be continuously interesting. For this work specially adapted aircraft are required. They must have an inverted-flying fuel system and ailerons and elevators must be so modified as to bring all possible maneuvers within scope: the inverted flick roll, or "pushed roll," for instance, as well as the more normal "spectacles," vertical-eight, with and without twist, tail slide and so on.

It has been a disappointment to me that no United States pilots have competed in this event. This year it was held again at Coventry in July; but there is also a "world championship" to be held in Prague. I feel that in this development Europe has something of interest. The utilitarian side of flying is of prime importance; but the absolute art of flying has some attraction and reaches its highest point in a skillful aerobatic display. Aerobatics degenerate too readily into circus turns; but in Britain we have succeeded in holding this annual contest and in making it something genuine and valuable.

Apart from aerobatics I return to my belief that the United States pilot is, at the moment, exceptionally lucky. But at this same time he may well cast an eye at the dire situation in Britain. We, too, once were lucky. Yet we have lost our accustomed place in the sun. END

Flying the Caribbean

(Continued from page 42)

as the shore line rapidly recedes, one overlooks this annoyance.

Radio navigation, especially for low-level unpressurized flight, is done almost exclusively with the ADF. Homing beacons of unbelievable clarity and power are available for use along most of the routes. For instance, the San Juan radio beacon on 391 kc has a rated power of 4,000 watts and will swing the needle of any good radio compass while your craft is still on the ground at Miami. Communications equipment en route from Florida to Puerto Rico actually can be a bare-minimum VHF transmitter (121.5, 122.5, 121.9); however, the modern lightweight omni-communications sets will be of greater use because of increased utility.

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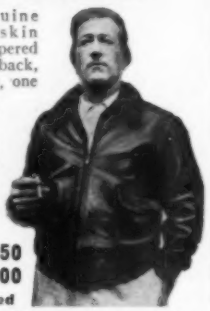

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the points of departure. A publication widely used in this area is *The United States Air Force Radio Facility Charts and In-Flight Data of the Caribbean and South America*. This publication is practically indispensable and may be obtained by subscription ($3.50 per year) from the Aeronautical Chart and Information Center, St. Louis, Mo.

For simplification, suppose we set up two hypothetical trips from Fort Lauderdale to Puerto Rico, one of the fastest growing vacation spots in the hemisphere. One trip should be in the light-twin class (Cessna 310, Apache, Aero Commander, Twin Bonanza, Twin Beech, etc.) with sufficient range capabilities. (Direct, Puerto Rico is approximately 875 nautical miles.) The second trip is in one of the modern, fast, four-place single-engine ships (Bonanza, Comanche, Cessna 182-210).

A direct flight is the simplest from many standpoints. Puerto Rico is a U. S. affiliate and, as such, inbound flights are not subject to customs or immigration clearance, if they have originated from the States. Such a flight needs only a VFR flight plan, procurement of survival gear, a call to the tower for takeoff clearance, and you're on your way.

The direct route takes you over the north tip of Andros Island (120 nautical miles from Fort Lauderdale), over the chain of atolls running northwest from Great Exuma Island, across the northern tip of Long Island just north of Acklins, then directly over Mayaguana Island. Next in line is the Caicos group. Lastly, Grand Turk shows 10 miles to the north as the last landfall between the traveler and Puerto Rico. You are now 575 nautical miles from Florida with about 300 more to go to San Juan on the northeast coast of Puerto Rico.

Up to this point you've passed 10 available landing facilities in close proximity. These include (from West to East) Bimini, Andros Central, Nassau, Eleuthera, Georgetown on Great Exuma, San Salvador, Mayaguana, Great Inague, South Caicos and Grand Turk. Service is extremely limited here. Repair facilities, especially, are practically non-existent past Nassau. Eleuthera, San Salvador, Mayaguana, South Caicos and Grand Turk are Army Air Force auxiliary bases allowing landings in emergency only. Of the others, Georgetown and Great Inague have 100-octane fuel. Georgetown is emergency only and at a cost of fifty cents per gallon, plus a $5.00 service charge; and Great Inague at sixty cents per gallon, which includes an unforgettable journey into town in search of the customs officer. If one has a use for salt, this is the place to stock up on this very necessary commodity—$30.00 a ton is the going rate, we believe—less, if you'd like to make a bulk purchase.

In view of these last disclosures, you can see that aside from customs there are other reasons for making the run nonstop, if the equipment is capable of such a flight. The distance from Grand Turk to San Juan is approximately 315 nautical miles on a heading of 120 degrees S. There are no more landfalls until Puerto Rico eases into view. After ADF needle reversal on San Juan beacon on 391 kc, a heading of 094 degrees will take you direct to San Juan International Airport, the official port of entry for the island. At 185 knots true with a 20-knot headwind, it should have taken you five hours and 20 minutes.

This same trip in a four-place single-engine aircraft will require a more detailed program. First, we can easily determine that division of the hop into two equal portions is the most feasible plan. Fort Lauderdale to Great Inague to San Juan—the first leg on a compass heading of 132 degrees for 468 nautical miles; the second on a heading 110 degrees measures 453 nautical miles. With accurate navigation this is well within our limits.

If the single-engine plane utilized for this flight is considered by the pilot to be borderline for these distances, there is a simple solution. Sunny South Aviation at Fort Lauderdale has installed extra range removable tanks in the rear seats of a great variety of small aircraft. A 30-gallon removable drum tied into the existing fuel system is feasible at a moderate cost—an extra two or three hours or range is excellent added insurance.

Now for the flight plan. Communications on Great Inague is by commercial wireless only, therefore closing flight plans can prove difficult. The flight plan is closed at Great Inague during one of their four daily communications schedules with Nassau control center. Nassau, in turn, radios direct to the point of departure. At the same time, your flight plan from Great Inague to San Juan is placed by this antiquated method. Under these conditions the first plan usually is not cancelled nor the second activated

(Continued on page 98)

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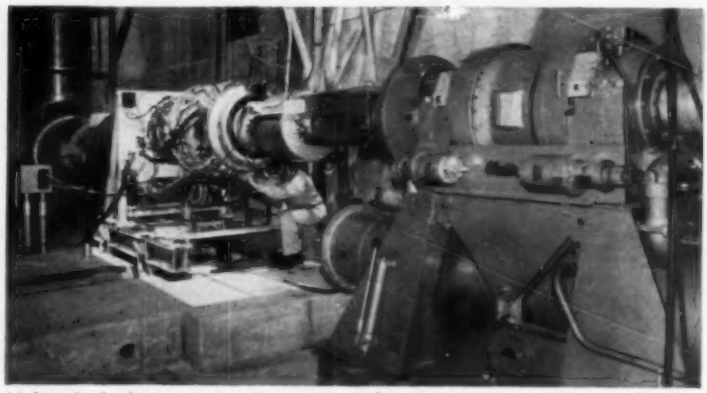

Making final adjustments to a Dart engine before dynamometer test in Airwork's shop.

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TURBINE DEVELOPMENT, operation and maintenance was the theme of Airwork Corp.'s recent Operations and Maintenance Symposium, held at its Millville, N. J., plant. Along with displays and exhibits, discussions included the following topics:

- Airwork and Atlantic Aviation's "Loaner Engine-Rental Plan" in support of Rolls-Royce Dart-powered corporate Gulfstreams. Plan permits the operator to "borrow" an engine while his Dart is being overhauled. The power package will be removed by Atlantic in Wilmington, Del., and loaner package installed on the aircraft. Engine and accessories will be sent to Airwork for overhaul. Following overhaul, original package will be reinstalled at Wilmington.

Plan insures availability of aircraft to corporate owner. Costs? A monthly standby charge; an hourly usage charge for time loaner power-package is flown; payment for overhaul of engine and accessories.

- Canadian Pratt & Whitney's small turbine, the 500-hp turboprop-turboshaft engine, aimed at fixed-wing and rotary-wing aircraft. The PT-6 currently is running in a test cell with a Hartzell propeller; will be used in certificated airframes (including a Beech E-18) next year. Basic weight of engine, 225 to 250 lbs.; the three-bladed propeller, developed by Hartzell and Hamilton Standard, weighs 100 lbs.
- Maintenance system for turbine-powered aircraft. FAA is considering development of a continuous maintenance system which would eliminate the need for the periodic inspection. Proposal, as outlined by FAA, will prescribe specific time limitations for inspection, overhaul and retirement of parts. Some 70,000 general aviation aircraft flew 11.5 million hours last year. A national average of 684 hours per year was flown by large aircraft.
- Premature engine removals. No specific pattern is apparent. Outstanding were the "flat" engines with a less-than-one-per-cent removal. Radials had a three-per-cent premature (unscheduled) removal rate and turbines promised to exceed this reliability.
- Engine life (piston). Continental engine panel discussion indicated that full-flow oil filters were an asset to the long life of any aircraft engine. Also: overleaning is possible in fuel-injection equipped powerplants. Roughness present when overleaning a carburetor-equipped engine may not be noticed when employing fuel injection (due to evenness of fuel quantities being delivered to individual cylinders).

Recommendation: use the fuel-pressure gauge in the leaning process. Some additional leaning may even fuel consumption between two engines; but overleaning in high power settings of high-compression engines can result in powerplant damage.

(Continued from page 97)

until well after arrival at destination. It is somewhat disconcerting to arrive after a three- or four-hour overwater flight, ask to have your VFR flight plan cancelled, only to be informed that none has been received. To eliminate such problems, the only practical method is to file direct Fort Lauderdale-San Juan with a one-hour fuel-and-customs stop at Great Inague, specifying total elapsed time.

For customs and immigration clearance at Miami, Fort Lauderdale or Pompano, one must procure a number of General Declaration forms (government form 7507); four of these are completed outbound to Great Inague, and three inbound to San Juan. Of these, stateside immigration takes one, customs takes two, one of which is returned with the official stamp and signature for presentation at arrival at first intended point of landing. Extra declarations should be carried, as some officials may request more than the usual number. Form I-94A is an arrival and departure record which must be made out for each passenger. The original is to be retained by U. S. immigration, the duplicate is to be turned in upon re-entering the United States or its possessions.

Here we must also mention that where customs, immigration and public health regulations are to be encountered, arrivals should be planned during normal working hours, i.e., 8-to-5. Arrivals at odd hours or on Sundays or holidays might be somewhat costly, possibly as much as $75.00 or more.

The Department of Public Health will require the spraying of the aircraft interior one-half hour prior to touch-down when arriving from foreign soil. For this purpose you can purchase any pressure-type insecticide bomb. They also require a smallpox vaccination and certificate. These may be procured from your family physician and must be notarized by a public official of the Board of Health in your municipality prior to departure.

Now that you've arrived in the heart of the Caribbean area, perhaps a discussion of points of interest and aviation facilities is in order.

Puerto Rico is the most verdant piece of real estate on which one will ever lay eyes. Ringing the entire circumference of this beautiful 110-by-35-mile island is a fertile coastal plain extending four to six miles inland to the sharp pyramid-like foothills. From these, the elevations climb steadily to the mountain range running east-west the entire length of the island. Highest elevation is a substantial 4,390 feet. However, the range averages 2,500 to 3,000 feet.

San Juan, with a population of approximately 500,000 is, of course, our major city. Others include Ponce on the south shore, Mayagüez on the west, Arecibo, Vega Baja and many others.

Aviation landing facilities are quite well spaced, so that one can fly from San Juan to an airport within reach of any one of the major areas by ground transportation. None of these have more than unicom except the two major airports in San Juan (San Juan International and Isla Grande), which of course have complete communications facilities. Except for Roosevelt Roads Naval Air Station, most airports in the Caribbean area are single strip east-west facilities. These are perfectly adequate since the winds are primarily easterly with velocities usually running between 10 and 20 knots.

Puerto Rico has a total of 11 airports and two seaplane landing areas. All but two of these airports have paved surfaces in comparatively good repair; the two unpaved strips are in obscure areas on the southern coast and of little probable importance to the tourist or businessman. None of these are located in the interior due to the mountainous terrain, but since most of the industrial activity is conducted on the coastal plain, this should pose no appreciable problem.

Occasionally, during twilight or evening hours, the itinerant pilot may encounter livestock and/or homeward bound pedestrians on the uncontrolled fields, therefore a circle or two of the field in question should be executed.

Winds in the area will occasionally become 30 to 35 knots. This, coupled with approaching rain showers, can cause extreme turbulence and wind shifts somewhat more violent than are encountered in the more temperate zones. A word to the wise is sufficient.

(Continued on page 100)

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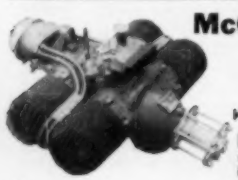

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(Continued from page 99)

Based on the island are some 110 civilian aircraft, including private, executive and charter units. Together with those based on neighboring islands, this concentration sometimes causes congestion at the major terminals approaching that of stateside high-density zones. When airline arrivals are added to this complement, you can see that a number five or six position in the traffic pattern at the International Airport may not be unusual.

After takeoff from International and prior to turning westbound, for instance, it is customary after leaving the tower frequency of 118.3 to switch immediately to Isla Grande tower on 118.7 for general traffic information and permission to proceed through the control zone to destination.

Maintenance is available at both major San Juan terminals. Caribair (Caribbean Atlantic Airlines, Inc.) does contract work at International, and West Indies Airways at Isla Grande is well equipped to take care of your every need. Hank Wolf, who runs this operation, is a thorough and well-versed operator on all types of aircraft for both major and minor repairs. West Indies is also an approved radio repair station for most types of equipment.

Most tourist activity is centered in the San Juan area. The air terminal at International houses a complete U. S. weather bureau, full communications station, FAA regional office, U. S. departments of Customs and Immigration, Agriculture and Public Health, post office, a hotel, numerous dining areas and many other services.

Flight distances here are comparatively short. We suggest that fuel be obtained at San Juan International, Isla Grande or Dorado Beach. Procuring fuel elsewhere on the island is often difficult. The 80/87- or 91-octane gas is available in 55-gallon drums only, at ninety cents per gallon. Because of its availability, 100 octane is used almost exclusively.

Sixty-four miles east of San Juan is the free-port island of Saint Thomas. Federal and State taxes are non-existent, and bargain hunting is the universal sport. Customs regulations on quantities purchased for specific sojourns should be carefully checked, however. Further east and southeast lie Saint Croix, Saint Maartens, Antigua—each unique in geography, history, language and culture. Aviation facilities are excellent, and a visit to any or all is worth the effort.

In the opposite direction, 40 miles west of Puerto Rico, is the table-like island of Mona, whose geography is beyond description. Sheer rock cliffs 350 feet high, riddled with deep inaccessible caves, plunge vertically into the indigo waters. On the southwest side a landing strip has been wrested from the eroded terrain. While it has fallen into disrepair, it is still usable for light planes. Sole inhabitants of Mona are a lighthouse keeper, wild boars and goats, giant iguanas and countless birds. Pirate treasure is said to be buried here, so take your shovel—and your camera.

With Puerto Rico as your base, deep-sea fishing off the south coast is excellent. Ground transportation is slow but a flight from San Juan to Santa Isabel or Ponce takes a half hour. A flying tour should cover the sugar cane fields, rum distilleries and

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sugar mills, pineapple and coconut plantations, the bays and beaches, the fabulous rain forest and some of the most precipitous mountains in the world.

If you like to have your aircraft close at hand, we suggest a vacation spot unparalleled in the entire area. The Dorado Beach Hotel, 28 miles west of San Juan, maintains its own airport and flight operation located three minutes from their main building. The runway is a paved 3,500-foot strip. Maintenance is available—the service manager, the same Hank Wolf mentioned previously in connection with West Indies Airways at Isla Grande.

Hotel facilities are superb, including a golf course, two miles of spectacular beaches, swimming pool, and tennis courts. The hotel maintains the finest air taxi service on the island, available for guests to or from airline connections at the International Airport, day trips to Saint Thomas and charters to any specific location in the Caribbean.

When next vacation rolls around, head south and pay us a visit. The Caribbean is a whole new world of adventure. END

Bright Star/Pine Cone III

(Continued from page 41)

groups to be airlifted, paradropped or landed aboard assault craft, included the famous 82nd Airborne Division and the 101st Airborne Infantry, numbering 13,000 men and including 3,300 tons of equipment, weapons and supplies.

All troops, equipment and aircraft were moved into the friendly country under attack (the North Carolina, South Carolina and Kentucky area) within five days. Planes, paratroopers and support personnel roughed it in true battle area style. Men lived in pup tents, ate from field kitchens, drank water from lister bags, battled mosquitoes and gnats, and so on.

All equipment and supplies were packed and loaded aboard air cargo carriers under forward base, flight line conditions.

As a light fog lifted from the main drop areas, at 1000 hours on the 20th of August, the first wave of paratroopers from the 101st Airborne Infantry, each carrying 70-80 pounds of equipment, streamed from C-119 chariots to establish a dramatic polka-dot pattern against a deep blue Carolina sky. Drop-point timing was excellent and all troops landed and deployed on schedule. Motorized equipment and heavy weapons followed. Subsequent waves of paratroopers and assault landing craft brought the total battle force strength delivered that first day to 7,000 men. Arrival of the 82nd Airborne on Tuesday, four days later, raised Bright Star's total for men in action to more than 10,000.

To the casual observer—those to whom parachute armies are classed passe in a missile era—the exercise may have been a bore.

To the inquisitive-minded citizen wanting to know how we did and what this action forecasts in terms of capability, the story was amazing and significant.

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(Continued on page 102)

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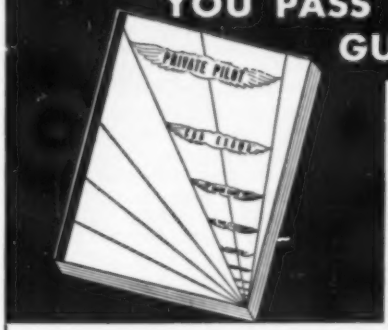

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(Continued from page 101)

flown for the period, four planes failed to make takeoff positions or returned to base, or landed at satellite fields due to minor mechanical problems; 21 dropped out for causes not related to aircraft capability.

Despite the age of the C-119s, officials believe their performance could not have been excelled. Air National Guard and Tactical Air Command jet fighters flew 897 close-air-support missions. The Republic F-105 made its first operational appearance.

From the paratroop operational end, U. S. Army commanders reported one death due to undetermined cause and six cases of troop injury requiring hospital attention.

Although there were no major tests projected of new equipment, certain items such as the M-14 rifle were carried by troops as part of reliability studies. The quick-release system, for freeing chute canopy from body harness after landing to reduce injury due to wind-tow, worked well. So did the automatic-release mechanism for cargo or equipment-type chutes.

It also is pertinent to note that drop calculations were made by electronic means, to accelerate drop-point computation for each aircraft.

Commanders of Bright Star/Pine Cone III summed up preliminary evaluations:

Lieutenant General Herbert B. Powell told newsmen in critiques following the exercise that re-action time of U. S. Army STRAC (Strategic Army Corps) is about one hour. He indicated that Bright Star/Pine Cone III demonstrates the ability of the Air Reserves to provide force mobility only after war has started. "The unknown is how fast and how far they can move without a declared emergency. Quite frankly, airlift is our problem."

He expressed concern over the lack of modern USAF airlift equipment for long-range troop carrier work. He believes the jet concept is inadequate for effective airborne force operations. "The jets may get us to the vicinity quickly but troops and supplies still must be carried to the assault zone by smaller, slower aircraft."

Major General Maurice A. Preston, commander 19th AF, and USAF exercise director, said that Pine Cone III indicates that Air Reserve effectiveness level can be held closely to that of active Air Force and that Tactical Air Command regards the air reserves as full fledged members of the command team. "All we need to do is find new aircraft for them."

With respect to reaction time, some reserve Air Force officers believe a constant-alert schedule can be established among reserve troop carriers in much the same manner as jet fighter alert duty has been performed by the Air National Guard. Through scheduled active-duty assignments we could have a "force ready to move around the clock when STRAC calls for airlift."

Boss of the Air Reserves, Lieutenant General William Hall, commander, Continental Air Command, had high praise for his team's performance with the ground forces. He told FLYING that "they (the Air Reserves) have completely fulfilled our confidence in their professional capabilities. Planning and implementation were outstanding. All of us at CONAC are rightfully proud of each reservist who contributed so much to make this giant exercise safe, successful and valuable . . ."

Gen. Thomas White, Air Force chief, said, "From a review of the results . . . it is obvious that our Air Reserves are capable of taking their places alongside our active military units."

Since Bright Star/Pine Cone III was designed to test the true capability of the Air Reserve troop-carrier force as it exists today under the new concept of placing reserve management under user commands, tactical commanders at Pine Cone have performance facts and figures with which to measure future potentials.

The air reservists have demonstrated eagerness to belong, ability to perform and a desire to excel now that a clearer cut mission was defined through practice. END

Toxic Hazards

(Continued from page 48)

with recovery. To produce any minor ill-effects on the human body, particularly on the lungs, oxygen must be breathed in concentrations of 80 per cent or more, for periods of many hours; and even then, the commonest symptom is only mild chest pain.

The agricultural pilot who sprays DDT, DDD, and especially organic phosphate chemicals, as well as other substances, should be aware of the possible toxic hazards both to himself and to the handlers of various mixtures used in spraying. Proper location of hoppers, proper loading procedures, prevention of spray and dust from entering the cockpit or re-entering the fuselage, use of proper protective clothing, and medical supervision when needed, all help in avoiding the toxic effects.

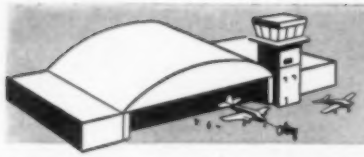
In aircraft crossing international boundaries, insecticides are sprayed into the cabins. These insecticides, which contain pyrethrum extract, DDT, and other chemicals, are safe and ill-effects are rare.

Accidental exposure of pilot and passengers to direct microwave radiation from airborne or ground radar equipment may cause a sensation of heat about the face, head, neck, chest and hands, with buzzing and tickling about the head and ears, and sparking between dental fillings; metal fragments or plates deep in human tissues may be temporarily heated. Exposures, however, usually are very brief; intermittent exposures over long periods of time never have been proved to cause serious damage to human tissues.

New developments in aviation bring possible new hazards. New aircraft and rocket propellants, such as methyl alcohol, ethyl alcohol, hydrazine, ammonia, JP-4 fuel, and the boranes, may directly or indirectly cause skin and eye and lung irritation, after over-exposure to the human body. The oxidizers, such as fuming nitric acid, fluorine, hydrogen peroxide, and ozone, may cause severe and even fatal injuries.

Liquid oxygen may cause sudden severe extraction of heat on contact with the skin, leading to serious burns. JATO fuel may form nitrogen dioxide, on combustion a highly irritant gas which can enter personnel compartments by devious routes.

Each new type of aircraft and each new substance used requires its own set of rules for proper handling. END



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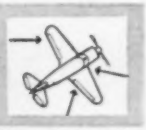

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SPORT Stop Wristwatch $9.95, Checkwriters $8.95, Golf Cart $14.95. Tweco, 155 Indio, Calif.

ANSWERS to Jeppesen Quiz on Page 57. 1. Bluff or high ground. 2. Approach light pattern. 3. Water tower and height. 4. Runway under construction. 5. Power line. 6. Large building and height.

Flying — November 1960 INDEX OF ADVERTISERS

ADVERTISER	PAGE NO.
Academy of Aeronautics	100
Acme School of Aeronautics	101
Aero Design & Engineering Co.	10, 11
Aero Products Research, Inc.	68
Aero-Progress, Inc.	72
A.I.R. Corporation	96
Air-France	7
Airline Operations Training, Inc.	101
American Airlines	21
American Flyers Incorporated	92
Aviart	95
Brantley Helicopter Corporation	93
C & E Manufacturing Co.	74
Cessna Aircraft Co.	78, 79
Champion Spark Plug Company	14, 15
Coffing Industries, Inc.	80
Collin's Radio Company	13
Continental Motors Corporation	90
Custom Enterprises	95
Dare Inc.	83
DeLong, D. F.	100
Desert Air Hotel & Resort	92
Don Juan Watch Bands	101
Douglas	5
Electric Autolite Company, The	95
Embry-Riddle Aeronautical Institute	73, 84
Esso Standard, Division of Humble Oil & Refining Company	55
Federal Ski & Engineering	70
Flying Book Service	91
Flying Equipment Sales Co.	96
Flying Movies	100
Fowler Aeronautical Service	56
Garrett Corporation, The	2nd Cover
Graubart Aviation Inc.	100
Gulf Oil Corporation	71
Hiller Aircraft Corporation	3rd Cover
Indiana Technical College	100
Insurance Company of North America	58
Jeppesen & Co.	57
Kane Aero Equip't	82
King Radio Corp.	62, 63
Lake Aircraft Corp.	12
Lee Air Electronics, Inc.	88
Manger Hotels	87
Messner, Inc., Julian	6
Mobil Oil Company	9
Motorola Aviation Electronics Inc.	76, 77
McCauley Industrial Corporation	97
National Aeronautical Corp.	53
Navion Aircraft Company	4th Cover
Newark Air Service	85
Northrop Institute of Technology	18, 19, 86, 102
Nova-Tech, Incorporated	65, 66
Pan American Navigation Service	84
Parks College	98
Phillips Petroleum Company	75
Piper Aircraft Corporation	60, 61
Puritan Compressed Gas Corporation	4
Rock Sound Club, The	68
Rolls-Royce Limited	1
Ross Aero Publishers	99
Ross School of Aviation	99
Scott Aviation Corporation	16
Shannon School of Aeronautics, Inc.	100
Shell Oil Company	69
Skycraft Design	101
Southwest Airmotive Co.	89
Spartan School of Aeronautics	94
Stadvec Aviation	96
Standard Oil Company of California	17
Teterboro School of Aeronautics	94
Time Industries	94
Todd's	92
U. S. Air Force	81
Valparaiso School of Aeronautics	58
Varsity Shop Specialties	68, 74
Weems System of Navigation	70
White & Sons, Inc., W. O.	80
White Plains Watch Co., Inc.	80
Zahns Airport	59

BRIEFINGS...

(Continued from page 8)

proceedings. Its author is Robert E. Redding, former assistant to two Civil Aeronautics Board members. Price for this 90-page manual is $2 from NASAO, 1101 Vermont Ave. N. W., Washington 5, D. C.

FIRST IN THE COMPANY'S 66-year history, the Ralston Purina Company of St. Louis has inaugurated corporate aircraft service with a Beechcraft H50 Twin-Bonanza and a Super G18. Purchased from

Young Aviation, St. Louis, both planes are white with red-and-white checker-board trim, the familiar company trademark. The flight crew includes Harry F. Tidler, Armond Hinkle—who is chief pilot—and James C. Doyle.

PIPER DISTRIBUTOR *for the southern Michigan area is the recently formed Aerodynamics, Inc., of Pontiac. Facilities include a modern two-story office building and large storage and maintenance hangar on Pontiac Municipal Airport. Under management of Frank P. Macartney, president, and Philip Stromberg, v.p., the operation is an authorized FAA electronic and repair station and Piper Aircraft factory-certified service center.*

REPORTS OF UNNECESSARY usage of the 122.8 communications frequency have become so widespread that the Federal Communications Commission is reported at the point of threatening crackdown on offenders. A late bulletin from the National Assn. of State Aviation Officials warns against such misusage which frequently blocks this frequency, often over a distance of 150 to 200 miles.

ONE-HUNDRED *paint designs and color schemes for private planes are presented in a booklet offered by Karl Koehler Design Associates, Coopersburg, Pa. The booklet sells for $2.50.*

PUBLIC AIRBORNE telephone service has been expanded to include the "golden triangle" area of New York, Pittsburgh and Washington, D. C. Present channels permit five air-ground calls at one time. Rates for the service are based on location of plane and distance to the person being called.

FOUR YOUNG WOMEN *engineers are the 1960 recipients of Zonta International's annual Amelia Earhart Scholarship Award for graduate work in aeronautical science. This brings the total awards granted by this executive women's service organization (in memory of A. E.) to 34, since it was established in 1940. Winners this year: Mrs. Frank Palvolgi, escapee from Hungary and graduate of McGill Univ., Montreal; Miss Judith Goff of Stanford University; Miss Shelia Evans of Tacoma, Wash., and British-born Miss Angela LaVigne, both M.I.T. graduates. Each of these awards carries a $2,500 grant.*

OSTEOPATHIC PHYSICIANS who also are pilots have formed The Flying Osteopathic Physicians Assn., (for short, FOPA) and lists some 124 members on its membership roll to date. Dr. W. W. Kiehlbaugh, Earling Clinic, Earling, Ia., founder and president, states the organization's goals and objectives closely parallel those of the Flying Physicians Assn. FOPA's plan to hold their first aviation seminar in Des Moines, in early November.

FIELD AVIATION LTD., *Toronto, Canada, has opened a large new business aviation center at Malton Airport. A new 73,000 square-foot fireproof all-concrete hangar provides for complete engine overhaul, maintenance, storage and servicing, and Beech aircraft sales and service. Offices, machine shops, guest lounge, restaurant and a pilot's planning room are situated nearby. The firm has also opened a new branch in Nova Scotia at Halifax International Airport.*

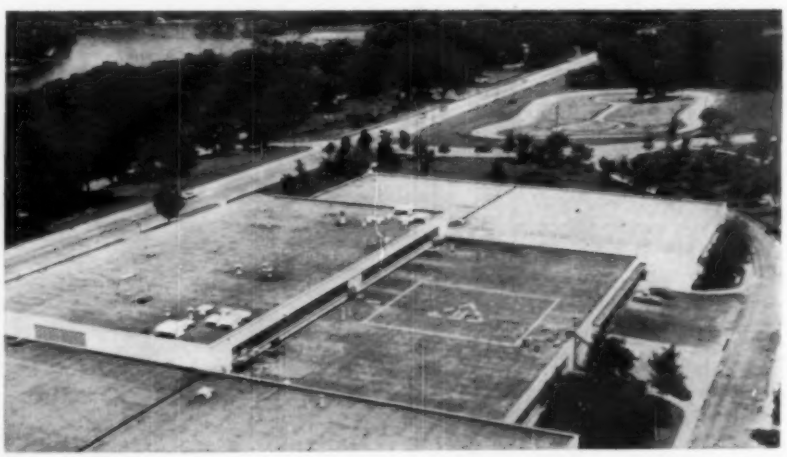
MERCURY FLYING SERVICE, INC., with headquarters at Sky Harbor Airport, Phoenix, Ariz., is named by Downer Aircraft Industries, Inc., as its distributor for the Bellanca 260 for the state of Arizona. W. L. "Bill" Hixon is company president. Mrs. Ruth Reinhold heads the firm's sales organization.

FORMATION *of a glider program for American Youth is being spearheaded by the Delaware Valley Soaring and Power Pilots Assn. with Jack Devins (Box 43), Abington, Pa., chairman of the association, as chief organizer. Program calls for financing purchase of glider trainers through collection of trading stamps. Arrangements already have been made for co-operation with a number of trading stamp companies. Collection centers will be set up in various states where all youth groups and adults subscribing to the movement will be able to deposit their trading stamps.*

POPULAR EDITOR-PUBLISHER of "Cross Country News," Miss Tony Page of Fort Worth, Tex., is honored "Woman of the Year in Aviation" by the Women's National Aeronautical Assn. Mrs. Pat Jetton, Dallas, Tex., WNAA president (left) presented the award to Miss Page at a dinner in her honor at the Western Hills Inn, Fort Worth. Among past winners of this coveted award are Jacqueline Cochran, Blanche Noyes and Jerrie Cobb.

LAKE AIRCRAFT CORP., *Sanford, Me., has moved its national sales headquarters and final test-flight operations to Granier Field, Manchester, N. H. The Air Force field also serves as the Manchester municipal airport. In addition, the Lake expansion includes charter service in the Lake Amphibian and a twin-engine airplane, plus flying instructions. Fuel and service also are offered at the new facilities located in the municipal hangar.*

FLORIDA'S AVIATION department has updated its state aviation directory of airports. A copy will come in handy if your plans include a flight south for business or pleasure. Write Aviation Department, Florida Development Commission, Carlton Building, Tallahassee. A reminder too, that the Bahama Development Board, Box 818, Nassau, offers a pocket-size booklet "Passport to Nassau and the Bahama Islands for Private Flyers." Included in the brochure is a map and listing of 22 landing strips in the Islands, along with pertinent information on accommodations and resort facilities.



PARKER PEN CO., *a pioneer in corporate aviation, has installed the first designated heliport in Wisconsin on the roof of its plant at Janesville. The port, a 75-foot square with an inner triangle pointing to magnetic north, will be used by helicopters which serve the firm on occasion. Additionally, it will serve as an air marker for aircraft flying in the Janesville area. The Parker firm has owned and operated fixed-wing aircraft since 1928. Ray Coyle is the company's chief pilot.*

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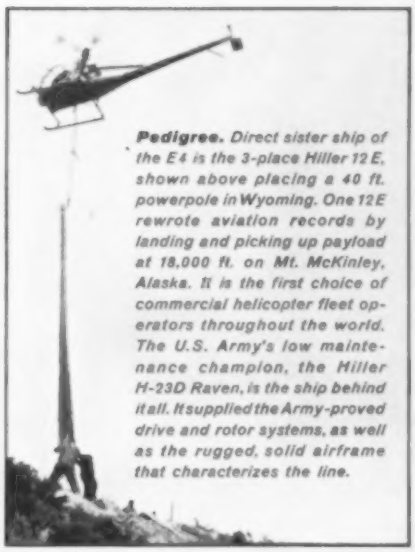

Pedigree. *Direct sister ship of the E4 is the 3-place Hiller 12 E, shown above placing a 40 ft. powerpole in Wyoming. One 12 E rewrote aviation records by landing and picking up payload at 18,000 ft. on Mt. McKinley, Alaska. It is the first choice of commercial helicopter fleet operators throughout the world. The U.S. Army's low maintenance champion, the Hiller H-23D Raven, is the ship behind it all. It supplied the Army-proved drive and rotor systems, as well as the rugged, solid airframe that characterizes the line.*

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